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Weights of fishing gear and equipment for calculating the stability of fishing vessels

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WEIGHTS OF FISHING GEAR AND EQUIPMENT

FOR CALCULATING THE STABILITY

OF FISHING VESSELS

BY

ARNE FARSTAD

(Redskaps- og utstyrsvekter ved beregning av fiskefartöyers stabilitet).

Report No. J 11.
Institute of Fishery Technology Research.
Trondheim, Norway
March, 1988

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ABSTRACT.

The basic principles of vessel stability are first discussed, followed by comments on problem areas and sources of error in the performance of inclining experiments.This experiment is the most common method used to determine the stability of a vessel under various loading conditions.

As a result of increased demands for catch efficiency as well as results of follow-up controls of stability data, it has become evident that there are requirements for updated weight data for gear and equipment . These can contribute to better agreement between the gear weights that are being used in vessel stability calculations and the size, weight and location of the equipment that is actually taken onboard.

The chief message of the report is therefore tables and diagrams that show the range of variations in the dry weights of gear and equipment.

The examples are intended to serve as a checklist and references for stability calculations for individual vessels.

Three key words.

Fishing methods

Gear weights

Stability

PREFACE.

The report contains a summary in the form of tables and diagrams of available information on gear and equipment depending on fishing method and vessel size. The objective is to improve the basic information available for stability calculations of fishing vessels.

Weight data presented in this report have been obtained from questionnaires and follow - up interviews with vessel owners and gear manufacturers.

The author would hereby like to thank all those that contributed information to the study.

The work has become relatively extensive, and it is our hope that shipyards, naval and marine consultants and government authorities can find useful information to assist them in their work.

The study has been financed through a grant from efficiency improvement funds through the Norwegian Ministry of Fisheries.

The work of collecting weight data, working these up and preparing the report has been chiefly carried out by staff at the FTFI Vessel Section in Trondheim and the Fishing Gear and Methods Section in Bergen.

Assistance was also received from Marintek Ltd.

Trondheim, March 2, 1988

A. Farstad

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SUMMARY AND CONCLUSIONS

Inclining experiments or tests for the determination of stability data (weight and determination of center of gravity) are carried out both for new and for rebuilt vessels before the vessel is fully equipped and ready to sail.

Final stability data are obtained by adding the weights missing which usually includes gear and spare equipment.

Key words for measures taken to meet demands for increased catch efficiency in the fishing fleet are:

- more gear
- larger gear
- new equipment and methods for gear handling

The conclusion of developments having taken place over the past 15 years must be:

- generally higher weights for gear and equipment
- higher center of gravity for gear handling.

An analysis of stability calculations shows that gear weights and spare equipment used in the calculations are often underestimated and are often in poor agreement with the equipment taken onboard at various times.

Equipment specifications are generally not very detailed and this makes it difficult to control if the weights given are correct or at least in right ballpark.It is possible that

stability requirements can be met by utilizing low weights and a center of gravity that is too low when operating close to limit values.Development trends in the fishing fleet and statistics over wrecks and damage at sea shows that the spotlight should primarily be on small and medium size vessels for the following reasons:

- Gear and equipment weights have a relatively greater influence on stability on small than on large vessels because the weights comprise a larger part of the displacement.

- Limitations on length and tonnage that are imposed as part of regulations and licensing are mostly found in vessels under 110 feet.

- There is a greater tendency for increasingly smaller vessels to take in use non-traditional fishing methods and larger size gear.

- Lack of space onboard can be the reason for moving spare equipment to a location that varies considerably from the location specified in the calculations.

The objective of this work has been to procure and present as best possible an up-to-date and correct picture of the total equipment carried by vessels pursuing various fisheries.

The chief message of the report is therefore a presentation of equipment weights or proposals for minimum requirements for gear- and associate equipment weights depending on fishing method and vessel size.

The results are presented in the form of tables and diagrams for each fishing method.

Relatively wide variations must here necessarily be accepted both regarding size and weight.

The examples in the report show the extent of gear and spare equipment onboard for various fishing methods ; these are intended to be used as check lists for the determination of the weight to be used in stability calculations for the individual vessels.

The values in the tables must only be used as a kind of guide for the total weight used in stability calculations for the vessel and fishing method in question.

The most important development trends within individual fishing method are briefly described.

Studies of stability calculations for about 50 existing vessels show an extensive underestimation of gear weights for all fishing methods compared to the values used as basis for calculation with equipment weights taken from the tables. It must be emphasized that both the method of selection, the numbers and the distribution of the vessels are not statistically valid to apply to the fleet as a whole.

The conclusion of this random sampling control is that, with few exceptions, vessel stability is poorer than that claimed in the stability documents.

Proposal for Measures.

1. The study documented that there is clearly a demand for better and more detailed specifications of gear and spare equipment in stability calculations.

The examples in the report that shows the size and weight of gear and equipment for various fishing methods can be used as a check list.

2. There is a requirement for improved competence in this area by naval- and ships consultants, ship yards and governmental agencies.

3. For combination vessels, the spotlight should illuminate the unfavorable conditions that can occur during fishing operations with respect to equipment and stability.

Opportunities for individual vessels to use water ballast to improve stability must be evaluated in this connection.

1. INTRODUCTION

The objective of this study is, depending on vessel size, fishing method and gear, to suggest a range, limited by min. and max. values, for weights of gear and spare equipment to be included in stability calculations. Exemptions from these limit values will of course occur since the weight data given can only be a guide ; it is the actual weight that should be used as basis for the calculations when final stability is to be determined.

The background is that both for new construction and existing vessels being rebuilt , inclining experiments to determine stability and center of gravity are usually performed without gear on board and without the vessel being fully equipped for a fishing trip.

A study of inclining test reports and inquiries from vessel owners in connection with disputes with shipyards regarding stability, has unfortunately shown that underestimation of gear weights and reserve equipment occurs frequently.

For vessels with skimpy margins to stability requirements, the use of low values for gear weights can represent a danger and be a contributing factor to near accidents and shipwrecks.

As known, weight alone is not decisive for calculating vertical moment; it is just as important to utilize the correct center of gravity for gear and the spare equipment taken on board.

Different arrangements and operating procedures indicate

that individual analysis of each vessel is necessary.

For vessels equipped with two seine bins and who for some periods have two complete seines onboard, calculations must be based on the most unfavorable stability conditions encountered.

In this connection it should be pointed out that for all gear types, and especially for purse seining, there is much "tailoring" to accommodate special customer requirements. Vessels equipped for the same fishery can therefore exhibit large variations with respect to gear weights, amount of equipment and vertical placement of equipment on board.

Weight increase as a result of water uptake applies to all gear types, but is most applicable in connection with purse seining.

Practical experiments that have been carried out show weight increases relative to a dry seine , and the parameters that are of greatest importance are discussed under the chapter on purse seines.

2. VESSEL SAFETY- STABILITY

First a short description of the most common expressions for vessel stability:

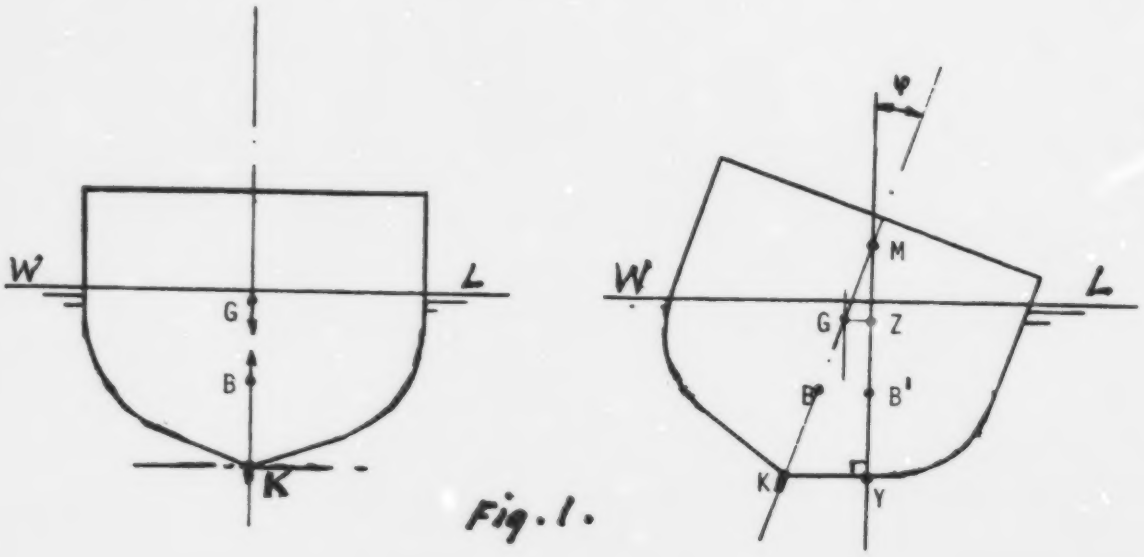


Fig. 1.

Left side of Figure 1 shows a cross section of a vessel floating upright in calm water.

G is the center of gravity of the vessel; the weight of the vessel that corresponds to displacement acts vertically downwards at this point.

B is the center of buoyancy ; it is the point through which the upward thrust of water surrounding the vessel may be considered to act. It is a force equal to the weight of water displaced by the vessel. The force acts vertically upwards through points B and G.

When the vessel,as in the drawing to the left, is upright or

is in static equilibrium, the buoyancy is equal to the weight of the vessel; G is as shown in the figure located above B.

K is called the keel point and is usually the point of interception of the center line with the midship section. All vertical distances are measured with K as basis.

KG is the distance of the center of gravity above the base line for a certain vessel load and/or equipment status.

To the right on Figure 1 the vessel heels at an angle φ due to an external force. Assuming that none of the cargo, equipment or other weights are shifting, G will be in the same position after heeling.

The underwater volume of the vessel will, however, change geometric shape and B will move to position B' when sideways stable equilibrium has been reached. A vertical line through B' will intercept the center line of the vessel in M.

M is called the metacenter of the vessel, and the height GM the initial metacenter height of the vessel.

At small heeling angles (under 5-7°), M will remain in the same place and the GM value will be an expression of initial stability at small heeling angles. A low GM- value means a "crank" vessel with relatively sluggish movements, while the opposite, a high GM- value, means a "stiff" vessel with a short roll period.

For a heeling vessel under dynamic conditions, the upwards force through B' and the weight in G will create a force couple that will turn the vessel towards the upright position again.

The force couple lever GZ is designated the righting lever and is an important measure for the stability of the vessel. From the figure it can be seen that as long as GM is positive, i.e. M is located above G , the righting lever GZ is then positive and the vessel has the ability to right itself after heeling to one or the other side.

GZ varies with the angle of heel,and is dependent on form stability, displacement and loading conditions and it can be seen from Fig. 1 that the expression for GZ becomes:

$$GZ = KY - KG \sin\varphi$$

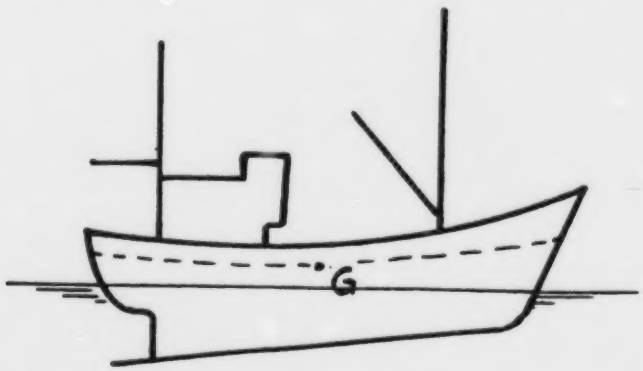
The formula consists of 2 parts.

KY is dependent on the shape of the hull both over - and under water, freeboard and any waterproof superstructures and deck structures that will be buoyant at larger angles of heel. KY for a vessel will vary with heeling angle and displacement.

The last part of the equation applies to the overall center of gravity location for the actual loading condition calculated on the basis of data for lightship, cargo, bunkers, gear, supplies etc.

It can be seen from the expression for GZ that the reducing link increases when G is moved upwards and also with increasing angle of heel.

2.1. Effect of permanent ballast and other constructive measures.



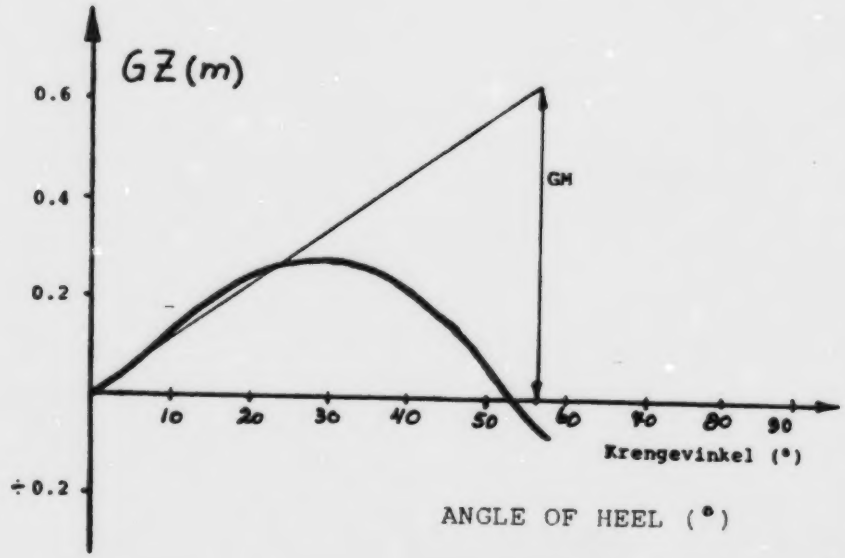
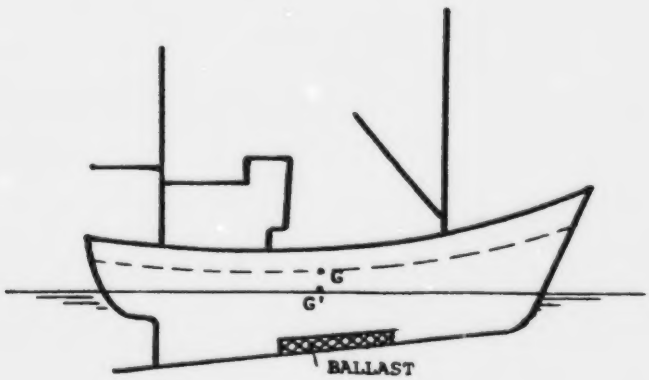


FIGURE A

Figure A shows a nearshore fishing vessel with GZ- curve for a certain loading- and equipment condition. Except for requirements for extending the GZ- curve, the curve shows that stability requirements have been met.

It can be seen that GZ=0 at an angle of heel of ca. 53°. At this heel the vessel no longer has a righting moment, and if no other forces act on the vessel, it will maintain this list in socalled unstable equilibrium. If forces from waves, wind or as a result of water penetration affect the vessel, the heel will increase. GZ will then become negative and the vessel will capsize. This can therefore happen even if the stability is good at small or moderate angles of heel.

2.2 Effect of permanent ballast.



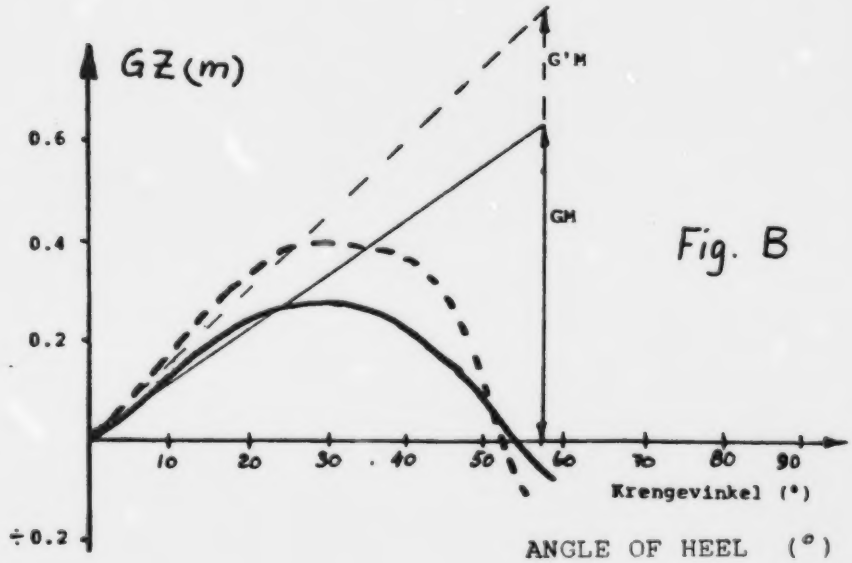


Fig. B

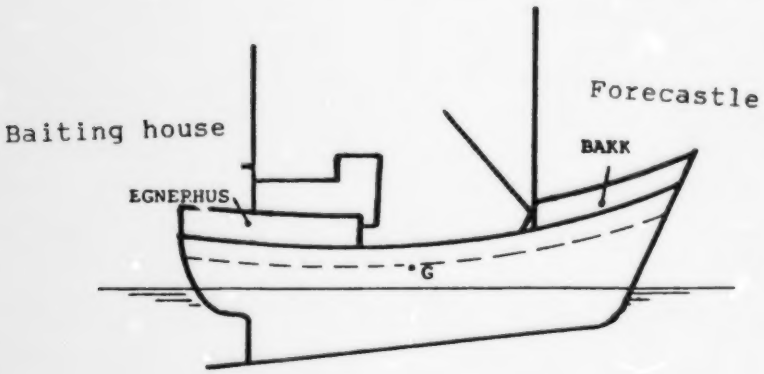
FIGURE B

Figure B shows an alternate method to improve the righting moment of a vessel by choosing to install permanent ballast in the bottom of the hold. This results in a displacement of the center of gravity downwards from G to G' and GM increases to GM' ; the vessel will have a quick, jerky motion in the water and the

roll period decreases.

By looking at the GZ- curve, it can be seen that the values have become higher, but an undesirable negative secondary effect is that the size of the stable area has been somewhat reduced. Due to the extra weight from the ballast, the freeboard, and thereby form stability, has been reduced. This method has therefore not improved the ability of the vessel to right itself after a sudden list , as for example caused by a breaker or heavy seas.

2.3. Effect of closed in superstructures.



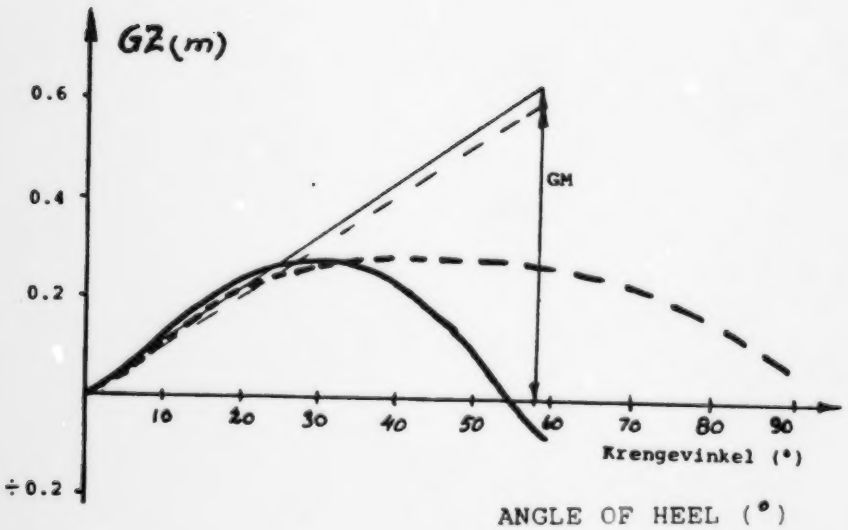


Fig. C.

Figure C shows an alternate method whereby a closed forecastle head and a corresponding closed- in superstructure aft on both sides have been built; only the midships area is open.

What often happens is that GM is somewhat reduced since the

weight of the added superstructures causes a raising of the overall center of gravity G. A reduction of GM can, however, be avoided by the use of a permanent ballast.

The righting moment GZ has not increased, but has a considerably larger area. This is due to the fact that when the baiting house (superstructure) and forecastle head, which are assumed to be watertight, enter the water at large heeling angles,they will have a righting moment that yields resistance to further heeling.

The result is that enclosed superstructures causes reduced stability at small heeling angles while the righting arm GZ is improved considerably at large heeling angles.

In practice the existing stability of the vessel will be decisive for choice of procedure. A combination of permanent ballast and enclosed superstructures will often give a good result. The ability of a vessel to right itself after heeling badly is different, but an important assumption that must be made is that hull, superstructure and deck houses are tight against water penetration.

Increase of freeboard as a result of lengthening etc. acts in the same manner as superstructure, namely to increase reserve buoyancy and thereby contribute to increasing the area or extent of the curve. Sheer in the deck has corresponding effect.

Increasing the width of the vessel will improve the initial stability (GM) (the stiffness), but does not contribute much to the area under the GZ- curve.

2.4. Upsetting -and righting moment.

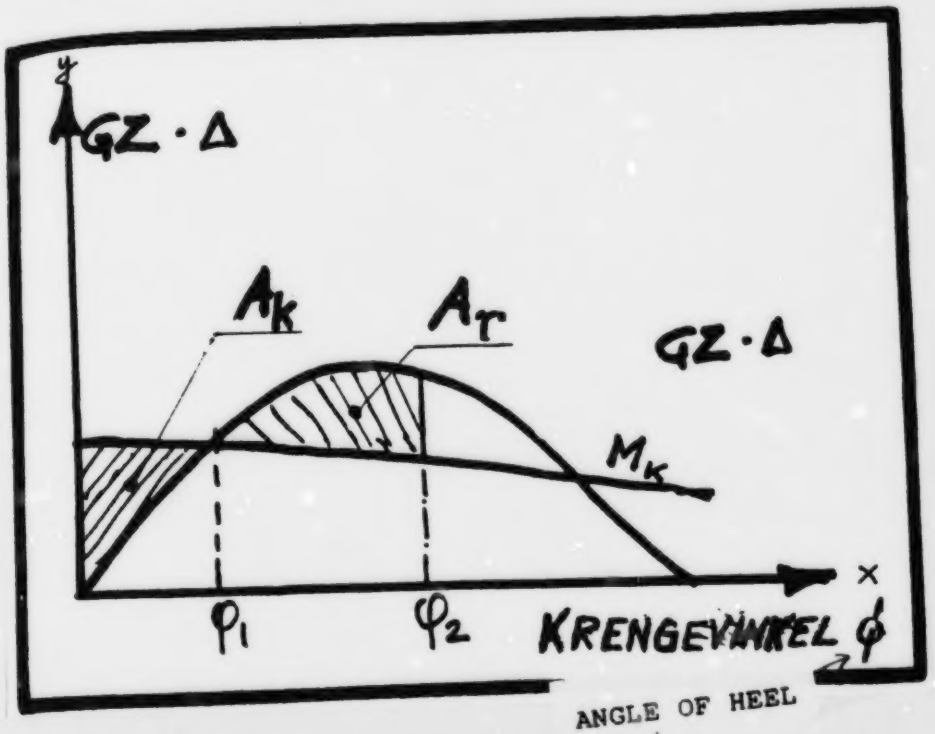
If the GZ- values are multiplied with the weight of the vessel (displacement) for a certain loading state, the righting moment will be given as a function of the angle of heel:

$$M = GZ \cdot \Delta$$

The area under this curve between two angles of heel is an expression for the work required to heel the vessel from one angle of heel to the other.

The whole area between the curve and the x-axis is an expression for the work required to heel the vessel from the upright to a capsizing position.

The curve gives an expression of the vessels resistance to heeling.In other words,when exposed to a constant heeling moment, a vessel will heel until there is balance between the heeling moment M_K and the righting moment M_r .



Kinetic energy at heeling angle ϕ_1 is expressed by the area A_K The rolling movement will stop at heeling angle ϕ_2 when kinetic energy is absorbed by the work A_r.

It must be emphasized here that this applies to stability in still water. In waves and heavy seas other conditions will also apply and influence the stability. Critical situations can occur when smaller vessels are running before the seas and have approximately the same speed as the waves so that the top of a wave can stabilize itself midships. The vessel "rides" on top of the waves, and if the waves come in on the quarter, a heeling moment is also added. The vessel looses waterline area, which means loss of stability, reduced initial stability (GM) and reduce righting arm GZ. In such situations where the stern is lifted by a wave midships, the steering can also be lost. The vessel can go into a form of broaching-to and be swamped.

There is , however, large differences between vessels to be exposed to such situations. Vessel stability, hull shape, use of speed and the skipper's knowledge of the vessel and their limitations will be decisive.

what can be done to "save the day" when a new or rebuilt vessel is ready for delivery and indications are that there are stability problems.

In some cases it might be enough to pull a little in the right direction when reading the data during the inclining experiment to save the situation. However, some re-inspections after shipwrecks have shown that there could have been manipulations of data that could not be defended. These could be connected with the following:

- Permission to carry out inclining experiments during inclement weather increases the opportunities for manipulations.

- Inspection of the draught marks forward and aft is not done, the marks can be placed too high and the displacement calculated is less than the actual value.

- Control weighing of the inclining weights used is not done and the actual weights can be less than those used in the calculations.

- It is possible to err in a favorable direction when recording the values by moving weights and in measuring the oscillation of the pendulum.

- Inclining experiments are permitted to be performed even if much equipment to come onboard is missing; in this connection underestimation and omission of weights.

- The value for KM used is too low; error or wrong reading of hydrostatic data; consideration of trim has been neglected.

2.5. The inclining experiment.

To carry out what is commonly known as an official inclining experiment is the most common method for final determination of weight and center of gravity for a fully equipped vessel. The experiment must be carried out in the presence of a representative from the Survey of Shipping (Vessel Inspection) and calculation of data for the Lightship Condition shall be assembled and sent to Norwegian shipping authorities for approval. In principle the experiments consist of moving known weights along a cross section of the vessel, calculation of heeling moments and heeling angles based on measurements (see figure on next page).

Average GM value is calculated based on at least 4 inclining experiments; the value for KM is then found for the actual trim from hydrostatic data, and the KG value for the vessel can be determined.

The actual procedures may seem clear, but in my opinion there have been some problems with control routines.

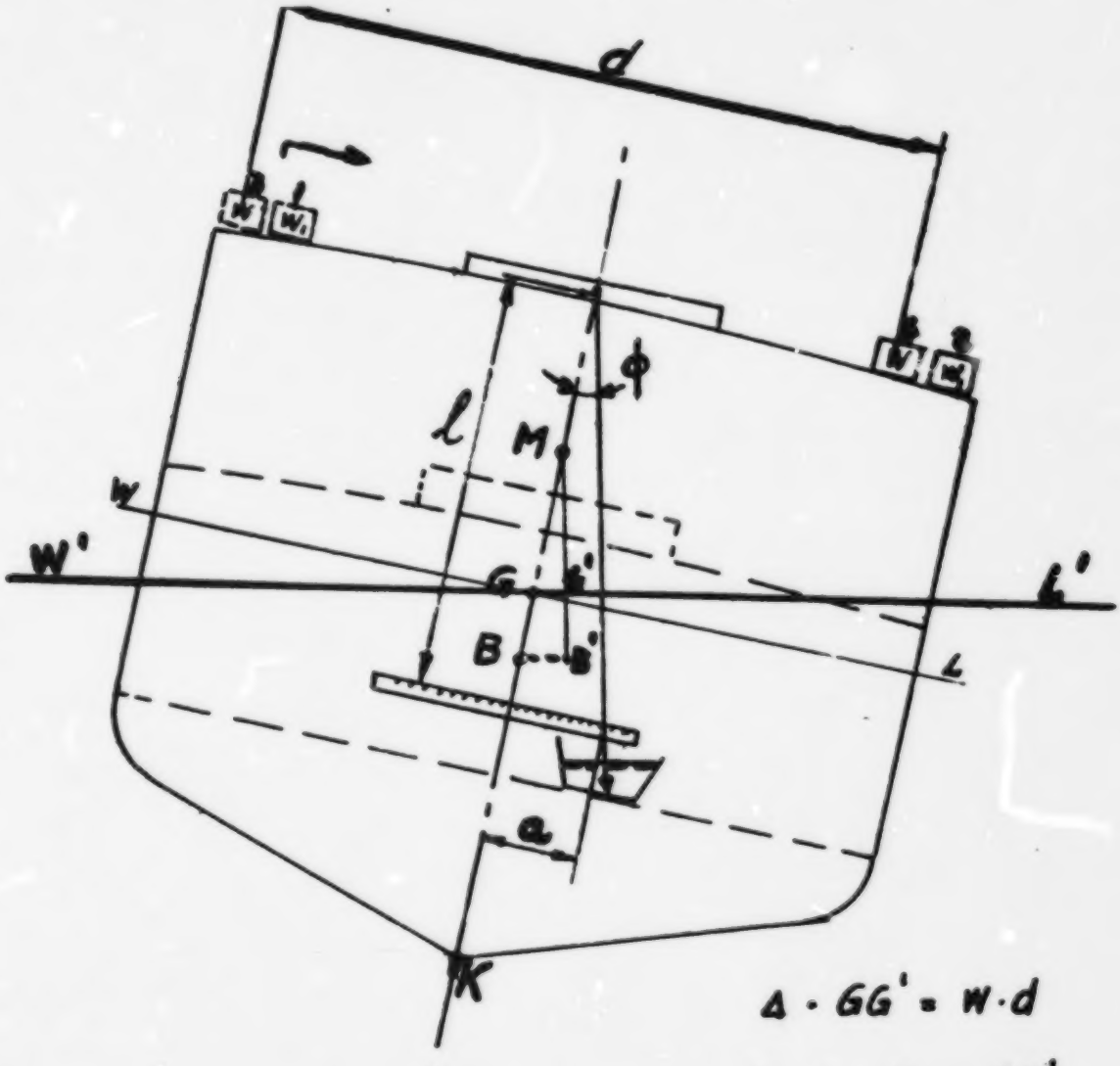
Sources of error.

If we disregard calculation errors that are difficult to eliminate completely, there are several reasons why stability data for a vessel are not correct.

Inclining experiments are usually carried out in a hectic final phase of construction, and questions can be raised about

KRENGEPRØVE FOR BESTEMMELSE AV LETTSKIPSDATA.

INCLINING EXPERIMENT TO DETERMINE LIGHTSHIP DATA



$$\Delta \cdot GG' = w \cdot d$$

$$tg\,\phi = \frac{a}{l} = \frac{GG'}{GM}$$

$$GM = \frac{w \cdot d}{\Delta \cdot \frac{a}{l}}$$

Δ = displacement of heeling vessel

Δ = depl. av fartøy som krenger.

$$KG = KM_T - GM_T$$

It is not my opinion that the bodies executing and controlling these functions only consist of "criminal robbers", but here as in other occupations, some fail and are not doing their jobs well enough.

The representative from the Bureau of Shipping (Ships Inspection) shall also be present to oversee and inspect, but it has happened that he has been unable to be present.

There are examples that skipper and crew after having taken over a new vessel have been so skeptical of the stability of the vessel that they have demanded a new inspection. Where FTFI have been involved in these reinspections, serious faults have been found and confirmed the skipper's suspicions.

<u>The Lightship weight increases with vessel age.</u>

In connection with alterations and rebuildings, the Ships Inspection demands that owners, shipyard or consultant shall notify of changes that can have an influence on the stability of the vessel.

In these cases there can, unfortunately, arise conflicts between owner and shipyard since involvement of the Ships Inspection usually means extra cost for the owner. There are examples where the owner has threatened to go to another yard if the requirement for reporting to the Ships Inspection is followed.

Without reporting the Ships Inspection has no opportunity

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to find out about rebuildings before getting suspicious about reports from later inspections. Only then can contact be made with the owner to clear up what took place and demand the necessary calculations.

Weight increases as a result of normal maintenance and the raising of standards of interiors will always occur as years go by. Even if this occurs slowly and not very dramatically the total can gradually be considerable and influence the stability. If a new inclining experiment is therefore not carried out after rebuilding, but only a correction made to the last experiment by adding or subtracting weights as a direct result of the rebuilding, one will not get a correct picture of the vessel stability.

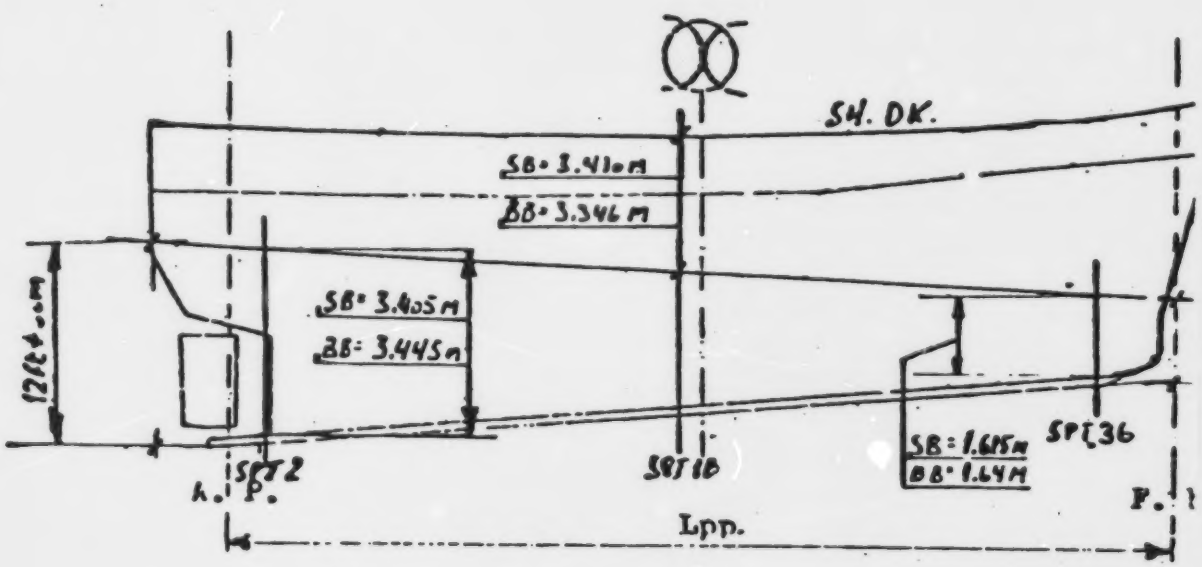
In general we wish to request both owner and yard to carry out a stability check of the vessel before the rebuilding contract is let and thereby confirm that further work is on a sound basis.

2.6. Example of a well documented inclining experiment.

The attached report from an inclining experiment for a new vessel from a shipyard gives the impression of good planning where reading of draughts during the inclining experiment was done from reference points marked off over the stipulated floating waterline. This in combination with freeboard determination midships seems to be a reliable basis for determining correct draught and displacement.

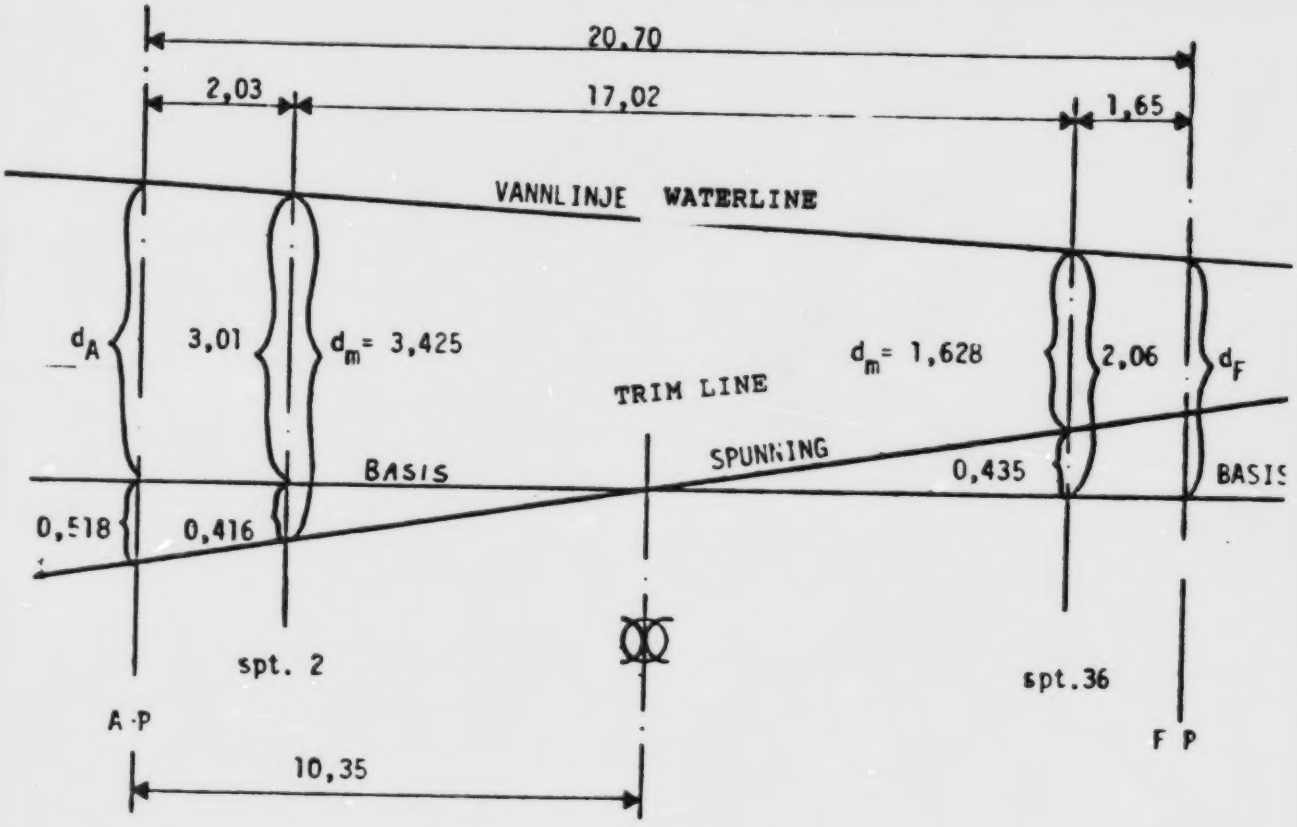
Lightship data from inclining experiment.

Draught of inclined vessel.



Draught readings spt.2 are made from center punch marks 3.50 m. over center line (" keel rabbet") and correspondingly spt. 36 from marks 2.50 m. above center line.

Sketch showing calculation of recorded draughts at punch marks to the position where the draught marks are marked.



Trim on Lpp (according to line drawing) 1035 mm.

Draughts above basis in A.P. and F.P.

$$d_{A_{AP}} = 3,01 + (3,01 - 2,06) \cdot \frac{2,03}{17.02} = \underline{3,12 \text{ m}}$$

$$d_{F_{FP}} = 2,06 - (3,01 - 2,06) \cdot \frac{1,65}{17,02} = \underline{1,97 \text{ m}}$$

The attached printout documents that hydrostatic data are determined for the actual waterline of the inclined vessel. This is an important condition to be able to determine correct KM-value.

KURVEBLAD DATA
DATABASE--1--DATABASE

B.NR.32(SHELTERD.)

DA(M)	DF(M)	VOL(M3)	DEPL(T)	LCB(M)	VCB(M)	LCF(M)	KMT(M)
3.122	1.971	202.87	207.95	9.435	1.694	8.826	4.274
3.222	2.071	216.51	221.92	9.396	1.756	8.809	4.224

BEREGNING AV I ETT SKIP

CALCULATION OF LIGHT SHIP

POS	TEKST	VOLUM	SP.GR. EGENV.	LCG	KG
NR.		M3	T/M3	M	M
1	SHIP DURING INCLINING EXPERI	207.95	1.000	9.545	3.67
2	INCLINING WEIGHTS	1.25-	1.000	12.000	6.70
3	TOWIG HAWSER	.10	1.000	20.000	4.70
4	GEAR	1.70	1.000	4.000	4.70
5	2 MEN ON TOP OF TANK	.15-	1.000	12.000	1.90
6	2 MEN ON SHELTERDECK	.15-	1.000	12.000	6.85

DISPLACEMENT LIGHTSHIP ...	208.20	TONN
VOLUME LIGHTSHIP (EG 1.016) ...	204.92	M3
VOLUME LIGHTSHIP (EG 1.025) ...	203.12	M3
LCG LIGHTSHIP	9.486	M FRA AP
KG LIGHTSHIP	3.665	M O.BL.
KG LIGHTSHIP (CORRECTED)	3.665	M O.BL.
DA LIGHTSHIP		M
DF LIGHTSHIP		M
GM LIGHTSHIP (KMT-KG).....		M

Calculation of loading state.

Excerpts of calculations of Lightship data ,shown on the previous page, must be considered as an ideal situation that should be aimed for before the inclining experiment is performed.

- The vessel is fully equipped and with minimum correction for weights to go ashore and onboard.

- The inclining experiment is done with all tanks empty.

- The number of sources of error is reduced to a minimum and a good basis for determining the correct lightship created.

Equipment included in the expression "VEGN" (Gear) should be better specified.

To determine lightship data as correctly as possible is an important condition for getting reliable results in later calculations of loading states. Documentation of relatively large numbers of weights of equipment missing can, however, be incomplete and the Ships Inspection has few possibilities for checking if the data given are probable or correct since the information is not enough detailed and poorly specified.

A such well known omnibus item as discussed in this report deals with gear and spares and to what extent there is agreement between the weight and gear placement used in the calculations and what is really brought onboard.

3. QUESTIONNAIRE SENT TO A SELECTION OF VESSEL OWNERS

Our most important partners in collecting, editing and updating gear weights have been:

Vessel owners/Managers/Skippers

Gear manufacturers

As part of the study we have therefore prepared and sent out a questionnaire with information on the objective of the study, to ca. 70 vessel owners with questions on :

a. Fishing operations and areas in 1986.

b. Amount of gear,gear dimensions and spares taken onboard for the fishing methods used.

c. Weights of gear and spares and weight increase when wet.

The background for the question on weight estimate under c) is connected with our experience that owners traditionally are asked about gear weights by shipyards, naval architects and other institutions that carry out stability calculations.

A comparison of these weight estimates for the same fishing methods between vessels can give an indication of the reliability and validity of these data.

In preparing and editing questionnaires, it was stressed that answers should be brief and not involve much work. In addition, a stamped, self addressed envelope was enclosed.

A reminder was given by telephone ca. 1 month after the letter was sent out, but in spite of these efforts, we only received answers from 24 of the 70, i.e. ca. one third.

The number was in our estimation a little low, and it has therefore been necessary to use other sources of information to supplement the information.This has chiefly taken the form of interviews with gear manufacturers and inspections onboard vessels by staff from FTFI and Marintek A/S.

RESULTS OF THE STUDY

Conclusions based on this study are:

1. Most vessel owners give reliable information on amount of gear and dimensions for equipment in use, but are somewhat careless in reporting the extent of their spares.
2. There is reason to be critical of the owners own evaluation of the total weight of gear and spares.

The answers given indicate in general a considerable underestimate of gear weights onboard.

The same applies to opinions on the differences between dry and wet weights.

TRENDS - CONSEQUENCES **p.22**

To achieve satisfactory financial results to meet economic obligations and give the crew fair shares, most vessel have had to fish more intensively. The following general initiatives should be mentioned in this connection:

- Poorer catch rates are compensated for by increasing the amount and size of gear.

- Investments in new gear and equipment to increase efficiency due to the competitive situation on the fishing grounds.

- More processing onboard to increase the value of the catch.

- Higher processing capacity onboard to avoid delays in periods with good fishing.

- In the trawl- and purse seine fishery there has been an increasing interest in fish behavior in the catch phase.

- Instruments for viewing and controlling gear and fish while fishing have been profitable investments.

- Use of underwater camera to study the behavior of different fish species towards fishing gears, and increased cooperation between users and producers in developing gear suited for the behavior of various species.

- Measures to lower noise from vessels and gear that might scare the fish.

The objectives of these measures have primarily been increased catch efficiency and value and therefore increased profitability. This objective has been met for our factory vessels and parts of the trawler fleet in the past 2-3 years.

The fleet renewal that has taken place within this sector, shows the following trends:

- Generally a sharp increase in the capital investment represented by the fleet.
- Larger capacity- and space requirements.
- Larger propulsion- and auxiliary power requirements.
- Larger physical dimensions of new vessels.
- Priorization of investments that are assumed to result in cost reductions.
- Increased risk for investments.

4. EXAMPLES THAT SHOW THE DIMENSIONS OF ONBOARD GEAR AND EQUIPMENT BY FISHING METHOD AND VESSEL SIZE.

Fishing methods: Herring purse seining- Crab fishing with traps.

Vessel size: Sjark, ca. 35 feet.

Specifications of gear and equipment.

SEINE	WEIGHT (kg)
Seine 162 x 35 fathoms	2300
Purse wire (14 mm, 300 fathoms)	350
2 (two) fish cages ea. 250 kg.	500
1 (one) dipnet (brail)	20
4 (four) fish cage poles ea. 25 kg.	100
10 (ten) anchors ea. 12 kg.	120
10 (ten) floats ea. 3 kg.	30
10 (ten) coils rope ea. 20 kg	200
TOTAL	3620 kg.

CRAB TRAPS

The gear used consists of 12 - 14 strings with 15 traps per string.

Normal fishing cycle is setting and hauling by string.

Maximum weight onboard when setting/hauling when about half the gear can be onboard at the same time.

90 traps with sinkers ea. 40 kg	3600 kg.
Catch of crabs	1000 "
TOTAL	4600 kg.

Fishing method: Shrimp trawling

p.24

Vessel size: Large sjark of ca. 40 feet

Gear and equipment specifications	Weight(kg)
2 (two) trawl doors ea. 300 kg.	600
2 x 1000 m.,12 mm. trawl wire on drum (0.50 kg/m)	1000
1 (one) trawl net in use	200
1 (one) trawl net in reserve	200
Bobbins, chain, floats (balls) etc.	700
Other spares	200
TOTAL	2900 kg.

Fishing method: Shrimp trawling

Vessel size: 60 - 65 feet

Gear and equipment specifications;	Weight,kg
2 (two) trawl doors ea. 700 kg	1400
2 x 1000 m., 14 mm. trawl wire on drum (0.68 kg/m)	1360
4 x 40 m., 14 mm. sweep wire and hauler (?)(0.68 kg/m)	110
1 (one) trawl net in use	380
1 (one) trawl net as spare	380
Rubber (open) bobbins, floats (balls) etc.	400
Spare equipment	400
TOTAL	4430 kg

Fishing method: Pollock purse seining p.25
Vessel size: 50 - 60 feet.

Fishing gear and equipment specifications	Weight(kg)
Pollock purse seine (200 x 35 fathoms)	3000
Purse wire on drum (16 mm , 500 m)	350
5 (five) fish cages ea. 250 kg	1250
1 (one) brail net	50
15 fish cage poles , l=5.5 m ea. 25 kg.	375
15 anchors ea. 30 kg	450
20 floats ea. 5 kg.	100
10 coils rope 120 m ea. 50 kg.	500
Various spare equipment	125
TOTAL	6200 kg

Fishing method: Gillnetting
Vessel size: ca. 49 feet large sjark.

Fishing gear and equipment specifications	Weight(kg)
220 gillnets ea. 15 kg	3300
Mechanical equipment	600
15 weights ea. 40 kg	600
15 anchors ea. 45 kg	680
12 high fliers ea. 20 kg	240
220 sinkers, rings ea. 1 kg	220
1250 floating rings ea. 0.4 kg	500
Spare equipment onboard	300
TOTAL	6440 kg.

Fishing method: Tub longlining
Vessel size: ca. 65 feet

Fishing gear and equipment specifications	Weight(kg)
100 tubs baited line ea. 35 kg.	3500
Line card(?)	40
16 weights ea. 180 fathoms ea. 40 kg	640
16 anchors ea. 30 kg.	480
20 high fliers ea. 20 kg.	400
Reserve equipment	300
TOTAL	5360 kg.

Fishing method: Autoline longlining
Vessel size: ca. 110 feet

Fishing gear and spare equipment specifications	Weight(kg)
Magazine for 35000 hooks	1100
De-hooker, hook cleaner, line card(?)	80
Line coiler	100
Splitter, de-twister	120
Baiting machine	350
Thawing tub for bait + bait cutter	550
Line + spare	1500
16 weights ea. 180 fathoms ea. 40 kg	640
16 anchors ea. 30 kg	480
20 high flyers, floats ea. 20 kg.	400
Spare weights, anchors, hooks,gangions etc.	650
TOTAL	5970 kg.

Fishing method : **Scottish seining**
Vessel size: **ca. 60 - 70 feet.**

Fishing gear and equipment specifications	**Weight(kg)**
Seine rope, dimensions 3 1/4"	
2 x 8 coils ea. 120 fathoms on each reel (140 kg/coil)	2240
2 rope reels ea. 400 kg.	800
1 seine net with bridles ea. 400 kg.	400
3 nets as spares ea. 200 kg	600
Various spare equipment	200
TOTAL	4240 kg

Fishing method: **Scottish seining**
Vessel size: **Ca. 75 - 90 feet**

Fishing gear and equipment specifications	**Weight(kg)**
Seine rope, dimension 3 1/2", length 3600 m.	2400
(8 coils ea. 150 kg. on each drum)	
2 rope reels ea. 400 kg	800
2 seine nets with bridles ea 400 kg.	800
4 seine nets ea. 200 kg	800
Reserve equipment	400
TOTAL	5200 kg.

Fishing method: Scottish seining p.28
Vessel size: ca. 90 feet (special vessel).

Fishing gear and equipment specifications	Weight(kg)
4 rope reels ea. 400 kg	1600
2 x 5 coils ea. 150 kg on one set of reels	1500
2 x 10 coils ea. 150 kg on other reel set	3000
2 seine nets in readiness on deck ea. 400 kg	800
2 sets of bridles per net ea. 300 kg.	600
4 reserve nets ea. 200 kg.	800
Spare equipment	500
TOTAL	8800 kg.

Fishing method : Shrimp trawling in the Barents Sea
Vessel size: ca. 120 feet. Engine output 500 HP.

Fishing gear and equipment specifications	Weight (kg)
2 (two) 5 sq. m trawl doors ea. 1050 kg	2100
2 (two) 4.5 sq.m spare doors ea 900 kg.	1800
2 x 1500 m , 18 mm steel wire on drum (1.18 kg/m)	3540
500 m , 18 mm trawlwire in reserve (1.18 kg/m)	590
2 x 70, 16 mm in use (0.90 kg/m)	130
400 m, 14 and 16 mm in reserve (0.80 kg/m)	320
1 set gear + trawl net	900
1 set gear in reserve	400
2 trawl nets in reserve ea. 500 kg.	1000
Various spare equipment	500
TOTAL	12,800 kg.

Fishing method: Pollock purse seining p.29
Vessel size: ca. 85 feet.

Fishing gear and equipment specifications.	Weight (kg)
Large seine: (360 x 85) fathoms	7500
Shallow seine: (245 x 70) fathoms	3500
2 x 1000 m., 16 mm wire on drum (0.93 kg/m)	1860
1 seine (small) boat	2000
8 fish cages ea. 300 kg.	2400
1 brail net	50
15 anchors ea. 30 kg.	450
20 floats ea. 5 kg.	100
Ropes and various spares	540
TOTAL	18,400 kg.

Fishing method: Shrimp trawling in the Barents Sea- Year around operation.
Vessel size: ca. 100 feet. Engine output: 850 BHp.

Gear and equipment specifications	Weight(kg)
2 trawl doors ea. 1400 kg.	2800
2 spare doors ea. 1200 kg	2400
2 x 1500 m, 20 mm trawl wire on drum (1.45 kg/m)	4350
500 m., 20 mm trawl wire in reserve (1.45 kg/m)	730
2 x 180 m, 12 mm/18mm sweeps/bridles in use(0.90 kg/m)	320
400 m, 12 mm/ 18 mm in reserve (0.90 kg/m)	360
1 set gear + trawl net in use	900
1 set gear in reserve	400
2 trawl nets in reserve ea. 500 kg.	1000
Various spare equipment	500
TOTAL	13,750 kg.

Fishing method: Herring- and industrial fish trawling. p.30
Vessel size: Ca. 100 feet.

Fishing gear and equipment specifications.	Weight(kg)
2 trawl doors ea. 1080 kg.	2160
2 x 1250 m, 16 mm trawl wire on drum	1950
4 x 140 m , 16 mm sweep wires and bridles	440
Gear, chain and floats	450
1 trawl net in use	500
1 spare trawl	500
Total	6000 kg.

Fishing method: Cod (groundfish) trawling (small trawler)
Vessel size: Ca. 110 feet

Fishing gear and equipment specifications.	Weight(kg)
2 trawl doors ea. 1200 kg.	2400
2 spares ea. 1200 kg.	2400
2 x 1300 m, 18 mm trawl wire on drum (1.18 kg/m).	3070
4 x 120 m, 18 mm sweeps and bridles (1.18 kg/m)	570
Gear, chains, floats	1500
1 trawl net + 2 in reserve ea. 600 kg.	1800
Spare shoes for doors + etc.	ca. 600
TOTAL	ca. 12,340 kg.

Fishing method: Groundfish (cod) trawling (large vessel) p.31
Vessel size: Ca. 150 feet. Fresh fish trawler, 1500 - 2000 BHP.

Fishing gear and equipment specifications.	Weight(kg)
2 trawl doors ea. 1750 kg.	3500
2 spare doors ea. 1750 kg.	3500
2 x 2200 m, 24 mm trawl wire on drum (2.09 kg/m)	9200
2 complete gear in use ea. 3000 kg.	6000
2 nets in reserve ea. 1500 kg.	3000
Reserve bobbins, chain, floats,shackles etc.	2500
Reserve shoes for doors + various equipment.	1000
TOTAL	28,700 kg.

Fishing method : Groundfish (cod) trawling (large vessels)
Vessel size: ca. 170 feet (factory vessels) 2500 - 3500 BHP.

Fishing gear and equipment specifications.	Weight(kg)
2 trawl doors ea. 2000 kg	4000
4 spare doors ea. 2000 kg.	8000
2 x 2000 m , 26 mm trawl wire on drum (2.46 kg/m)	9840
2000 m, 26 mm trawl wire as reserve in coil (2.46 kg/m)	4120
2 trawl gear with equipment in use, ea.3.5 tonnes	7000
2 gear with equipment in reserve ea. 3.5 tonnes	7000
Reserve bobbins, chains, floats etc.	3500
Spare shoes for doors + etc.	1500
TOTAL	45,760 kg.

5. FISHING METHOD: GILLNETTING AND LONGLINING p.32

For fishing vessels in the size range 25 - 120 feet, this is definitely the most common fishing method along the coast.

It is well known and accepted that the catch efficiency of passive fishing gear types is dependent on fish species, fish size, fish concentration and gear density. Recent studies have in addition shown that effects on vision and odor stimuli are of great importance for behavior and activity in the vicinity of gear. For example, a considerable increase in catchrates for longline has been achieved by changing hook size, hook types, bait size and type, materials and colors, hook distances etc.

Common for these gear types is that a changeover to new and lighter materials has resulted in a considerable reduction in weight. On the other side , however, the fishing intensity has increased; more gillnets and hooks are being fished per fisherman than before and new equipment for mechanizing operations are being taken in use.

Developments have therefore in total meant increased weights for gear and spares.

There are considerable differences between districts with respect to type and amount of gear used due to the following:

* Fishing area- distance to fishing grounds
* Operational- type and amount of gear.
* Vessel sizes - number of crew.
* Fish species - utilization of catch - landing opportunities.
* Bottom, depth and current conditions etc.

The above mentioned conditions that are of great operational importance, usually require local adjustments and can to a certain degree affect outfitting requirements and therefore gear and equipment weights.

It must be considered an impossible task to include all the variations that exist, and we do not attempt that in this study.

The objective is to find usable average values for each fishing method.

The results of our studies are shown in the diagrams and tables in the following pages.

VARIASJONSOMRÅDE

RANGE OF VARIATIONS

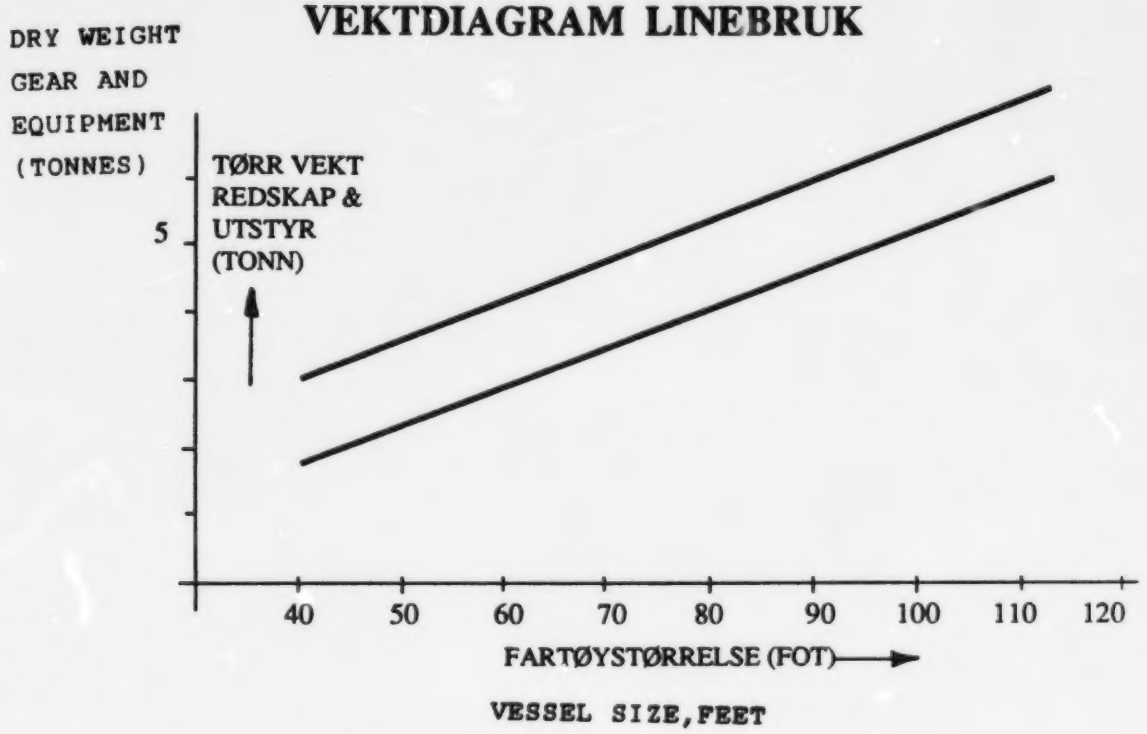
5.1 REDSKAPS-/UTSTYRSVEKT FOR

GEAR / EQUIPMENT WEIGHTS FOR

GARNDRIFT GILLNETTING						LONGLINING LINEDRIFT				
FARTØY-VESSEL SIZE (FEET) (FOT)	GILLNETS NUMBER OF NETS (TONNES) (TONN)	GRAPNELS ANCHORS NUMBER WEIGHTS (TONNES) (TONN)	HIGH FLYERS BUOYS FLOATS SPARES (TONNES)	UTSTYR GEAR FOR OTHER FISHING METHODS (TONNES)	TOTAL TOTAL WEIGHT (TONNES) (TONN)	LONGLINE GEAR NO. OF HOOKS WEIGHT (TONNES)	GRAPNELS ANCHORS INCL. SPARES (TONNES)	HIGH FLYERS BUOYS FLOATS SPARES (TONNES)	GEAR FOR OTHER FISHING METHODS (TONNES)	TOTAL WEIGHT (TONNES) (TONN)
35 - 50	100 - 200 à 15 kg 1,5 - 3,0	8 - 15 à 95 kg 0,7 - 1,4	0,5 - 0,9		2,7 - 5,3	8000-15000 0,8-1,7	10 - 20 à 35 kg 0,4 - 0,7	10 - 20 0,5 - 0,9		1,7 - 3,3
50 - 70	150 - 230 à 15 kg 2,3 - 3,5	15 - 20 à 95 kg 1,4 - 1,9	0,5 - 1,1		4,3 - 6,5	12000-25000 1,4-2,8	15 - 25 à 35 kg 0,6 - 0,9	15 - 20 0,6 - 1,0		2,6 - 4,7
70 - 90	200 - 250 à 15 kg 3,0 - 3,8	15 - 20 à 95 kg 1,4 - 1,9	0,7 - 1,3		5,1 - 7,0	20000-30000 2,2-3,4	20 - 30 à 35 kg 0,7 - 1,1	20 - 25 0,7 - 1,2		3,6 - 5,7
> 90	250 - 300 à 15 kg 3,7 - 4,5	15 - 20 à 95 kg 1,4 - 1,9	0,8 - 1,5		5,9 - 7,9	30000-40000 3,2-4,2	20 - 30 à 35 kg 0,7 - 1,1	0,8 - 1,3		4,8 - 6,6

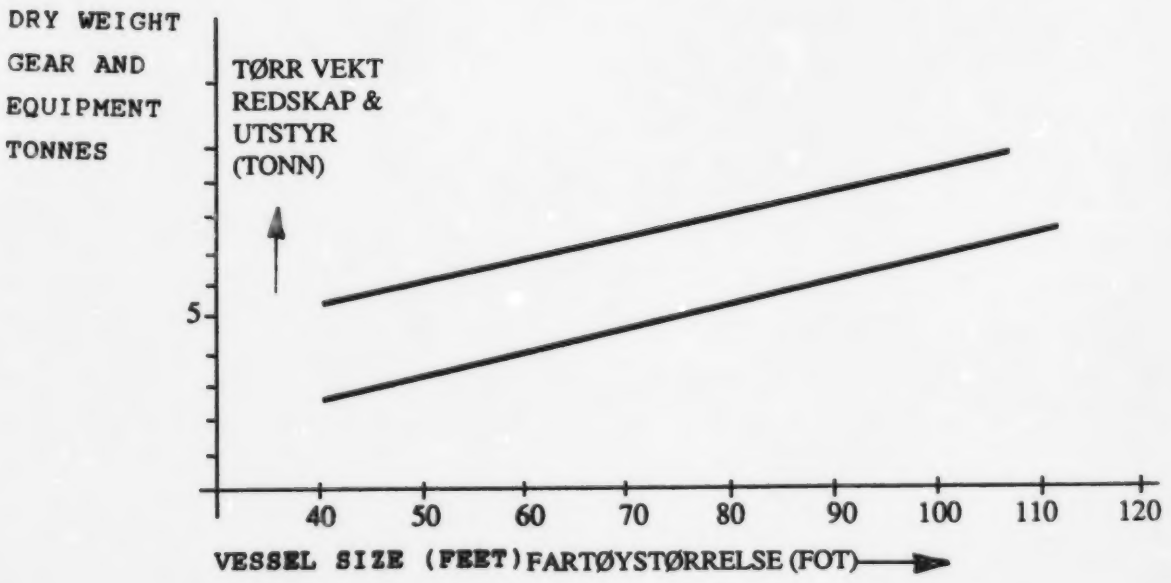
WEIGHT DIAGRAM LONGLINE GEAR

VEKTDIAGRAM LINEBRUK



WEIGHT DIAGRAM GILLNET GEAR

VEKTDIAGRAM GARNBRUK



6. FISHING METHOD: SCOTTISH SEINING p.35

This fishing method has a relatively strong position in certain coastal districts, for year round operation for some, but usually used in combination with other gear types on a yearly basis. Vessel sizes varies between 50 and 90 feet and gear dimensions vary to a certain extent with the size.

Gear and spares in the form of extra seines, ropes etc. that are taken onboard depend on the area fished; if the vessel will fish close to home or for example off the coast of Finnmark where opportunities for repairs and service are limited. In recent years there has been an extensive mechanization of gear handling, but as far as we know, only one vessel so far has specialized on Scottish seining on a year around basis. Arrangement for gear handling onboard this vessel with 2 complete seines ready for setting, has as primary objective to increase catch efficiency to be more competitive on the grounds.

The vessel is equipped with a double set of rope reels, a total of four. The operation is therefore prepared for different depths and grounds and no time is lost if it would be necessary to change gear.

Scottish seining has traditionally been a typical shallow water fishery , i.e. a fishery under good light conditions. The visibility of the ropes that sweep the fish together was considered to be of great importance even if the seine itself moves very little. The new trend is gear development for fishing at greater depths and experiments indicate that there is nothing that indicates that the sweeping effect of the ropes is less at greater depths. It must therefore be assumed that the light intensity even at greater depths is sufficient for fish to see both the ropes and the seine.

Studies show that the weight of a seine can vary between 250 and 650 kg. depending on vessel size.

The following examples show the results of weighing experiments of Scottish seine nets for a vessel ca. 80 feet.

Small seine	Weight
180 mesh courlene seine w/ rope wings	230 kg.
Dropper chains	180 "
Butterfly etc.	40 "
TOTAL	450 kg.

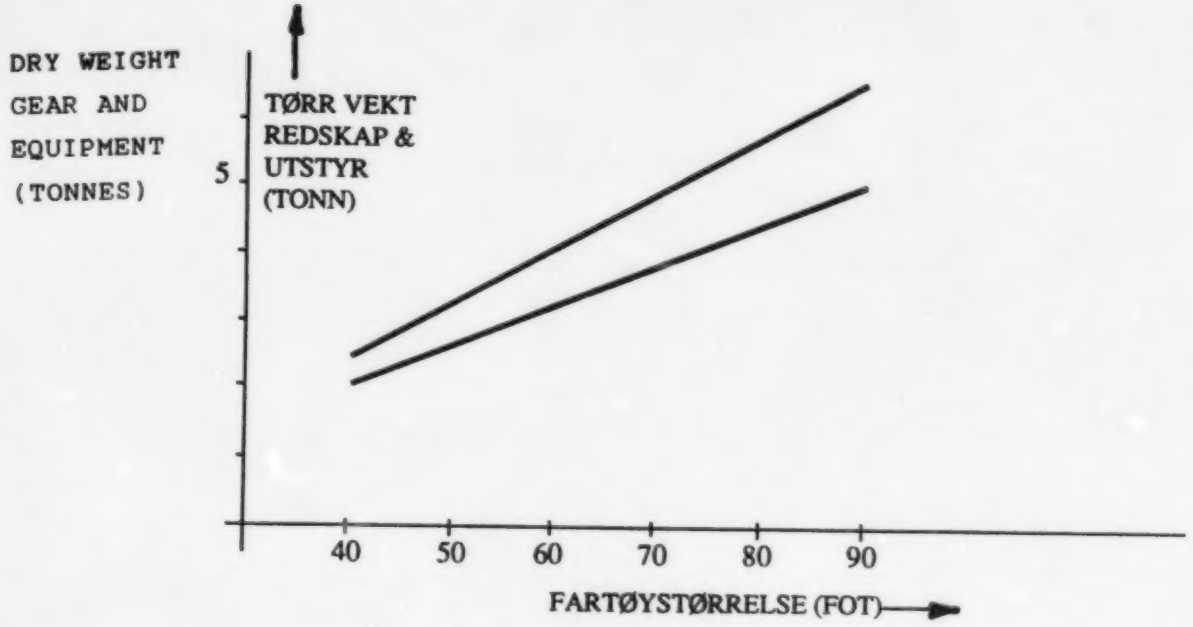
Large seine	
210 mesh nylon seine with long wings	310 kg.
Dropper chains	300 "
Butterfly etc.	40 "
TOTAL	650 kg

RANGE OF VARIATIONS

6.1. GEAR / EQUIPMENT WEIGHTS FOR SCOTTISH SEINING FISHING

VESSEL SIZE (FEET)	ENGINE OUTPUT (HP)	ROPE LENGTH DIM. WEIGHT (TONNES) (TONN)	SEINE + BRIDLES (TONNES)	SEINES IN RESERVE (TONNES)	SPARES FOR REPAIR AND MAINT. (TONNES)	ROPE REELS WEIGHT (TONNES)				TOTAL DRY WEIGHT GEAR & EQUIP. (TONNES)
		Coils								
40 - 50	200 - 450	2 x 5 kveiler à 220 m 0 = 3 1/4" 150 kg/kveil 1,4 - 1,5	kg/coil 0,3 - 0,5	1 stk. 0,3	0,1					2,1 - 2,6
50 - 70	350 - 650	2 x 7 kveiler à 220 m 0 = 3 1/4" 1,9 - 2,2	0,6 - 0,9	2 - 4 stk. à 200 kg 0,4 - 0,8	0,2 - 0,4	2 stk. à 400 kg 0,8				3,8 - 5,0
70 - 90	450 - 800	2 x 8 kveiler à 220 m 0 = 3 1/2" à 160 kg/kveil 2,4 - 2,7	0,7 - 1,1	3-4 stk. à 300 kg 0,9 - 1,3	0,4 - 0,7	2 stk à 400 kg 0,8				5,2 - 6,6

WEIGHT DIAGRAM SCOTTISH SEINE GEAR



7. FISHING METHOD: TRAWLING p.39

The best known and common methods are cod(groundfish) trawling, shrimp trawling, capelin trawling and trawling for industrial fish (meal and oil).

Within each of these there are a number of different gear and sizes to fit the user (vessel size, engine size etc.). The actual weights of gear and spares will therefore differ considerably if the gear for large and small trawlers are compared.

It would for instance be an obvious connection between the size of spare equipment and the fishing operation of the vessel (length of trip, product spectrum, fishing area etc.) If we use as an example a vessel trawling for shrimp in the summer, the trips must be based on icing the catch and are therefore limited due to raw material quality. An operation like this means that there will be little spare gear and equipment onboard.

Measures to increase the catch efficiency have been the trend in recent years, and of concrete measures can be mentioned:

- Installation of more energy efficient and quiet propulsion systems with larger pulling power. This has primarily meant better towing power and efficiency, especially under poor weather conditions, but it also makes it possible to tow trawls with larger dimensions.

- Deck arrangements with double trawl tracks on the trawl deck means that lost time can be reduced and effective fishing time increased by using 2 complete trawls alternately during fishing operations.

- There seems to be a growing interest in all countries to obtain knowledge on fish behavior in relation to gear in the water.

- Fish spotting equipment is being introduced where fish species and sizes can be determined from the echograms.

- Sensors are mounted on the gear for continuous surveillance of important gear parameters such as:

* distance between trawl doors
* height and geometry of trawl opening
* amount of fish in the trawl

- There is increasing interest and understanding among fishermen on the requirements for effective management and control and optimal exploitation of resources meant to be a common resource. These measures will be important in this respect:

* selective properties and mesh sizes of gear to reduce the bycatch and killing of undersize fish
* protecting growing-up areas for young fish
* inspection activity.

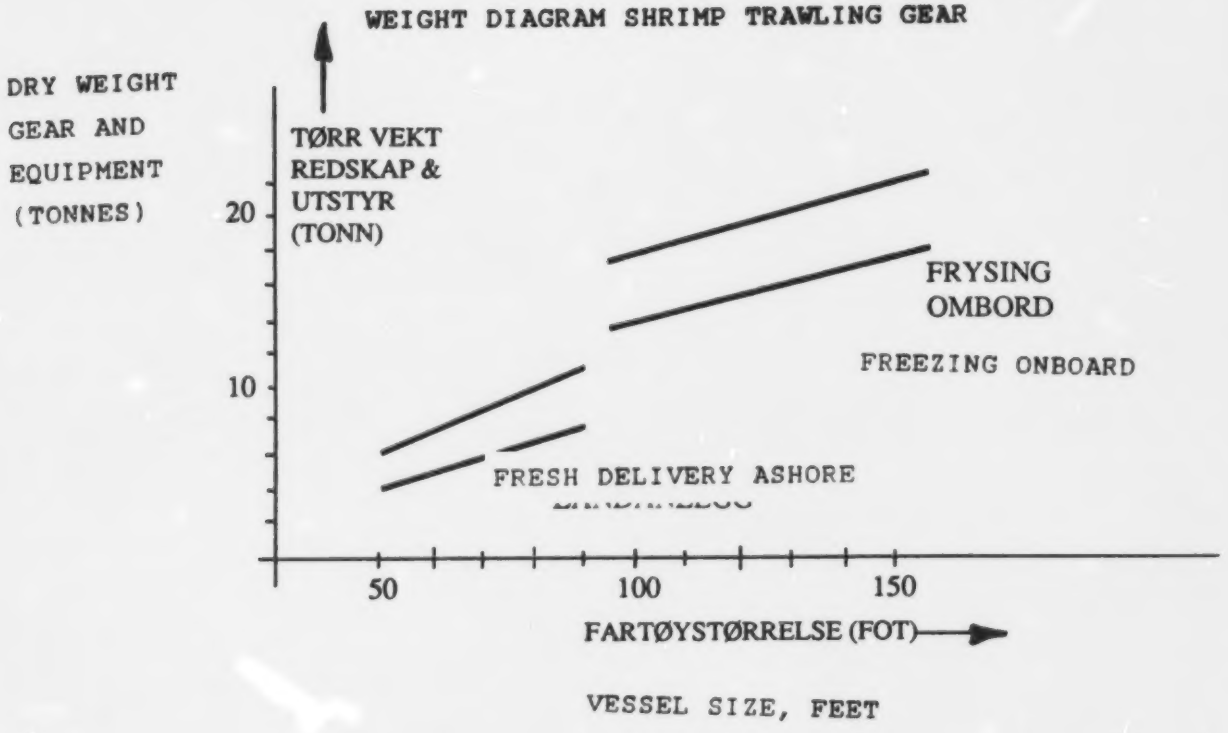
RANGE OF VARIATIONS

GEAR / EQUIPMENT WEIGHT FOR TRAWLING

7.1. REDS ... DRIFT

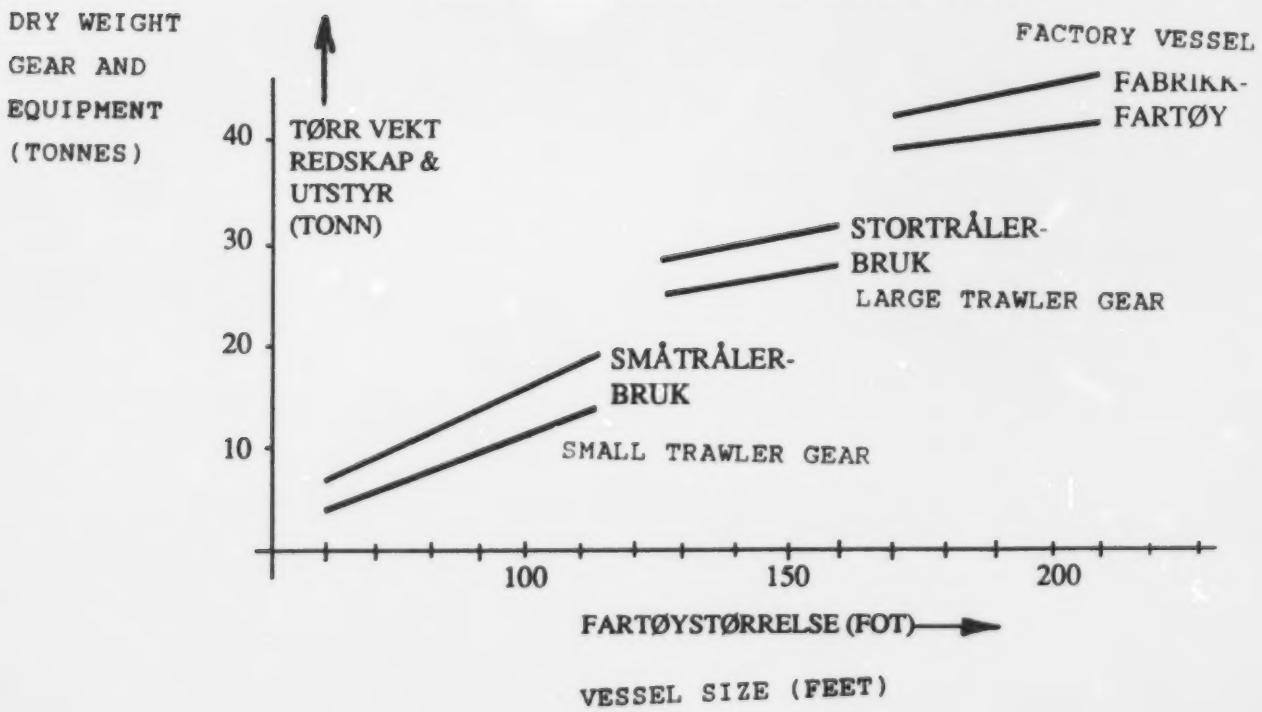
VESSEL SIZE (FEET) (GT)	MOTOR ENGINE OUTPUT (HP)	TRAWL TYPE	TRÅL-TRAWL DOORS (TWO) (TONNES)	RESERVE SPARE TRAWL DOORS (TONNES) (GT)	TRAWL WIRE WARPS SWEEPS ETC (TONNES)	SPARE WIRE SWEEPS GEAR (TONNES)	TRAWLS GEAR ETC (TONNES)	SPARE TRAWL NETS (TONNES)	VARIOUS EQUIPMENT FOR REP. & MAINT. (TONNES)	TOTAL DRY WEIGHT (TONNES)
50 - 70	250 - 450	REKE-TRÅL	0,7-1,4	—	1,0 - 1,2	0,2 - 0,4	1,4 - 2,2	0,4 - 0,6	—	3,7 - 5,8
		TORSKE-TRÅL	1,2-1,8		1,0 - 1,2	0,2 - 0,4	0,8 - 1,2	0,4 - 0,6		3,6 - 5,2
70 - 90	400 - 800 (shrimp trawl / cod trawl)	REKE-TRÅL	1,4-2,4		1,8 - 2,2	0,6 - 1,0	1,5 - 3,0	0,5 - 1,2	0,5 - 1,0	6,3 - 10,8
		TORSKE-TRÅL	1,4-2,0		2,0 - 3,6	0,8 - 1,4	1,5 - 2,0	0,5 - 1,0	0,5 - 1,0	6,7 - 11,0
90 - 120	800 -1500	REKE-TRÅL	2,4-3,2	2,0 - 2,4	4,0 - 4,6	1,4 - 2,0	3,0 -	4,0	1,0 - 1,2	14,8-18,9
		TORSKE-TRÅL	2,0-3,2	2,0 - 2,4	4,0 - 5,0	1,4 - 2,0	2,0 - 3,0	0,5 - 1,2	1,0 - 1,2	12,9-18,0
120 - 150	1000-2000	REKE-TRÅL	3,0-3,5	2,4 - 3,0	4,0 - 5,0	2,0 - 2,5	4,0 - [illegible]	1,5 - 2,0	1,0 - 1,5	17,9-22,7
		TORSKE-TRÅL	3,0-3,5	3,0 - 3,5	5,0 - 7,0	2,0 - 3,0	[illegible] - 6,0	2,0 - 3,0	1,0 - 2,0	21,0-31,0
>150	>2000	TORSKE-TRÅL	3,5-4,0	7,0 - 8,0	9,0 - 10,0	3,0 -4,0	6,0 - 7,0	6,0 - 7,0	3,0 - 5,0	37,5-43,0

WEIGHT DIAGRAM SHRIMP TRAWLING GEAR



WEIGHT DIAGRAM COD (GROUNDFISH) TRAWLING GEAR

VEKTDIAGRAM TORSKETRÅL



8. FISHING METHOD : PURSE SEINING p.43

This gear type incorporates a varied selection of sizes, mesh sizes, materials and twine thickness for catching various pelagic fish species in coastal and distant waters. Gear manufacturers have traditionally a wide product spectrum to meet different requirements; from owners of sjarks of ca. 35 feet to our largest purse seiners of over 200 feet. The amount of gear and spares to be taken onboard in the outfitting stage will depend on the following:

- Vessel size, space available (bin capacity)
- Gear type
- Pelagic fish species
- Area of catch - distance from home port
- Utilization of catch
- Owners personal judgement

If one should briefly attempt to give a description of developments in this sector in the past 10 - 20 years, the following key words come to mind:

- Catch efficiency
- New materials
- Mechanization

The following concrete developments should be mentioned:

- New vessels and many existing vessels are arranged with two seine bins and can in periods have two complete seines onboard (large - and shallow seines). This is often a permanent arrangement on the largest seiners.

- Smaller vessels tend to become compressed versions of the larger purse seiners.

- Through the years developments have been towards larger physical dimensions of seine gear and equipment.

- Requirements for increased sinking speed have resulted in a considerable increase in lead weight.

- Larger dimensions, especially depth and lead weight, has

resulted in higher strength requirements for seine twine. The following measures have been taken to meet these requirements:

* increased thread size
* changing of mesh shape (4-sided,6-sided)(square/hexagonal)
* new materials with better strength properties

- Some gear manufacturers claim that the largest North Sea seines with a weight of close to 28 tonnes seem to represent a limit.

- Seine manufacture is a labor intensive, competitive industry with high requirements for cost reducing measures.

- In recent years there has been a tendency to outfit sjarks with purse seines in seasons they are not fishing groundfish with passive gear.

EXAMPLES OF NAMES, DIMENSIONS AND WEIGHTS OF SEINES. p.45

The following examples illustrate a representative selection of the products included in purse seining.

SPRAT SEINE

Dimensions: L ~ 200 - 250 fathoms (f.), D ~ 40-50 f.
Twine: 84 "omfar"*), thread no. 1.5 - 2.0
Lead weight: ca. 700-1000 kg.
Total weight:ca. 2500 - 3100 kg.

SMALL HERRING SEINE (COASTAL SEINE)

Dimensions: L ~ 160 - 190 f., D ~ 30 - 40 f.
Twine: 40 - 42 "omfar", thread no.3.
Lead weight: ca. 250 - 400 kg.
Total weight:ca. 2000 - 3000 kg.

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*) "Omfar" = number of meshes per "alen"= 62.7 cm.

MEDIUM SIZE HERRING SEINE

Dimensions:	L ~ 260 -300 f., D ~ 50 - 60 f.
Twine:	40 - 42 "omfar", thread no. 5.
Lead weight:	ca. 1000 - 1400 kg.
Total weight:	ca. 6000 - 8500 kg.

SMALL POLLOCK SEINE (SHALLOW SEINE).

Dimensions:	L ~ 220 - 250 f., D ~ 40 - 50 f.
Twine:	22 - 26 omfar, thread no. 4 - 5.
Lead weight:	ca. 1000 - 1200 kg.
Total weight:	ca. 3500 - 5000 kg.

LARGE POLLOCK SEINE ("BIG SEINE")

Dimensions:	L ~ 34 - 370 f., D ~ 70 - 80 f.
Twine:	22 - 26 omfar, thread no. 6.
Lead weight:	ca. 1500 - 2000 kg.
Total weight:	ca. 7000 - 9500 kg.

MACKEREL SEINE (NORTH SEA SEINE) p.46

Dimensions:	L ~ 350 - 370 f., D ~ 80 - 90 f.	
Twine:	40 omfar,thread no.6&8,	ca. 11,000-13,500kg
Lead weight:		ca. 4600-5300 kg.
Rings:		ca. 2500-3000 kg.
Floats:		ca. 1400-1700 kg.
Rope:		ca. 1500-1800 kg.
Total weight:		ca.21,000-25,300 kg.

CAPELIN SEINE

Dimensions: L ~ 300 - 320 f., D ~ 80 - 90 f.

Twine: 64 omfar, thread no.5.

Lead weight: ca. 4000 - 4500 kg.

Even if the dimensions are smaller than a North Sea seine, considerable more twine is used due to the small mesh size. The total weight will be in the same order of magnitude, between 20 and 25 tonnes.

RANGE OF VARIATIONS

VARIASJONSOMRÅDE

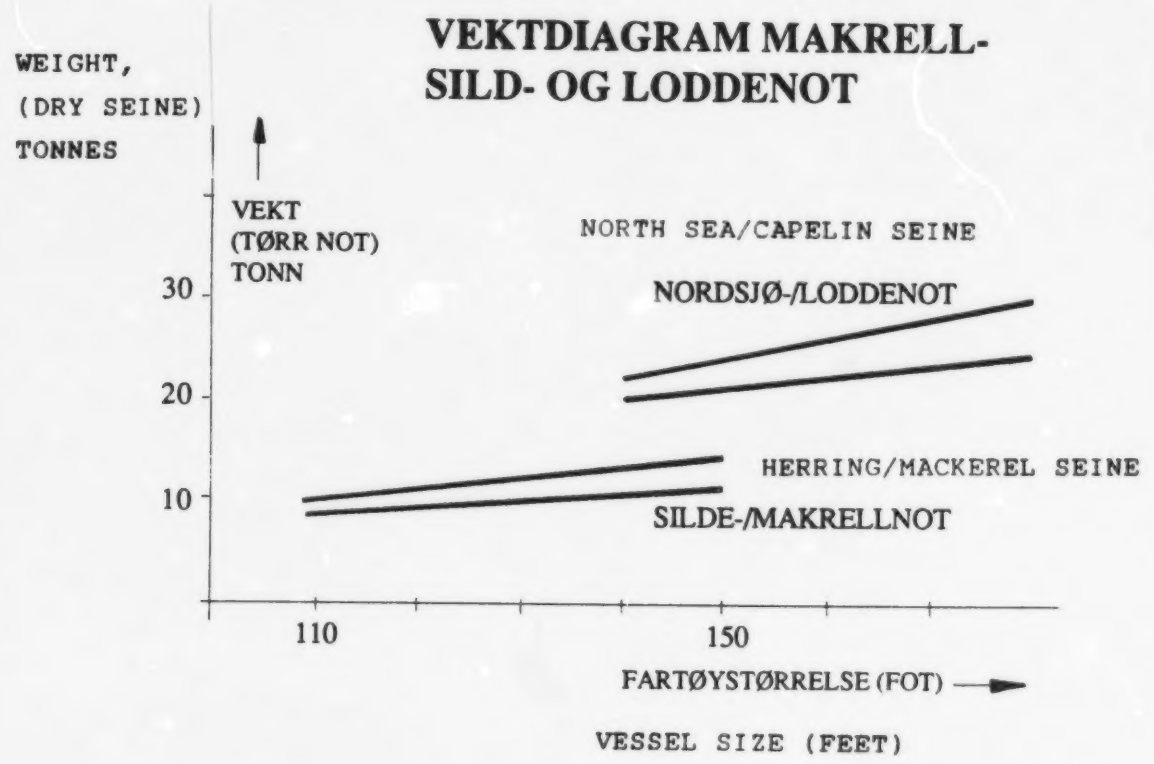
GEAR / EQUIPMENT WEIGHTS FOR SEINING

8.1. REDSKAP/UTSTYR NOTDRIFT

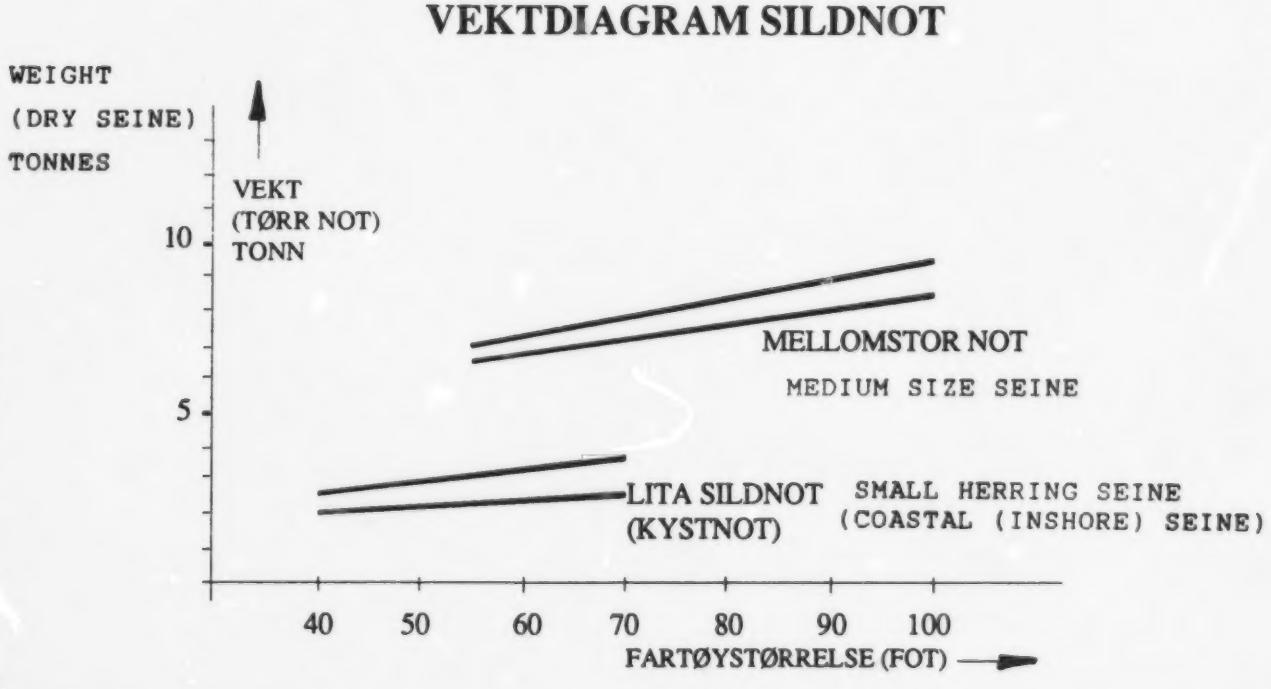
VESSEL SIZE (FEET)	LARGE SEINE DIMENSIONS WEIGHT (TONNES)	SHALLOW SEINE DIM/WT (TONNES)	PURSE WIRE DIM/WT (TONNES)	PURSE SKIFF WEIGHT (TONNES)	NET CAGES + VARIOUS EQUIP. (TONNES)	TOTAL DRY GEAR& EQUIP. WEIGHT	NOTES
35 - 50		L ~ 140-170 fv D ~ 25-35 fv 2,0 - 3,0	1 1/4"-1 3/4" ca. 500 m 0,3 - 0,4	På slep ---	0,5 - 0,8	2,8 - 4,2	
50 - 70		L ~ 220-250 fv D ~ 40-50 fv 3,0 - 4,0	1 3/4" ca. 800 m 0,4 - 0,6	1,4 - 1,6	1,5 - 1,8	6,3 - 8,0	
70 - 90	L~ 340-370 fv D ~ 70-80 fv 8,0 - 9,5		2" ca. 1000 m 0,7 - 0,9	1,5 - 1,8	1,8 - 2,0	12,0 - 14,2	Only large seine onboard
90 - 120	L~ 340-370 fv D ~ 70-80 fv 8,0 - 9,5	L~ 220-250 fv D ~ 40-50 fv 4,0 - 5,0	2 1/4" ca. 1000 m 0,9 - 1,1	1,8 - 2,0	2,0 - 2,5	16,7 - 20,1	2 seines onboard at same time
120 - 150	L~ 340-370 fv D ~ 80-90 fv 12,0 - 14,0	L ~ 260-300 fv D ~ 50-60 fv 7,0 - 8,0	2 1/2" ca. 1200 m 1,4 - 1,6	2,0 - 2,4	------	22,4 - 26,0	2 seines onboard at same time
> 150	L~ 350-370 fv D ~ 80-90 fv 21,0 - 23,0	L ~ 350-370 fv D ~ 80-90 fv 21,0 - 23,0	2 1/2" ca. 1200 m 1,4 - 1,6	2,0 - 2,4	------	45,4 - 50,0	2 seines onboard at same time

WEIGHT DIAGRAM

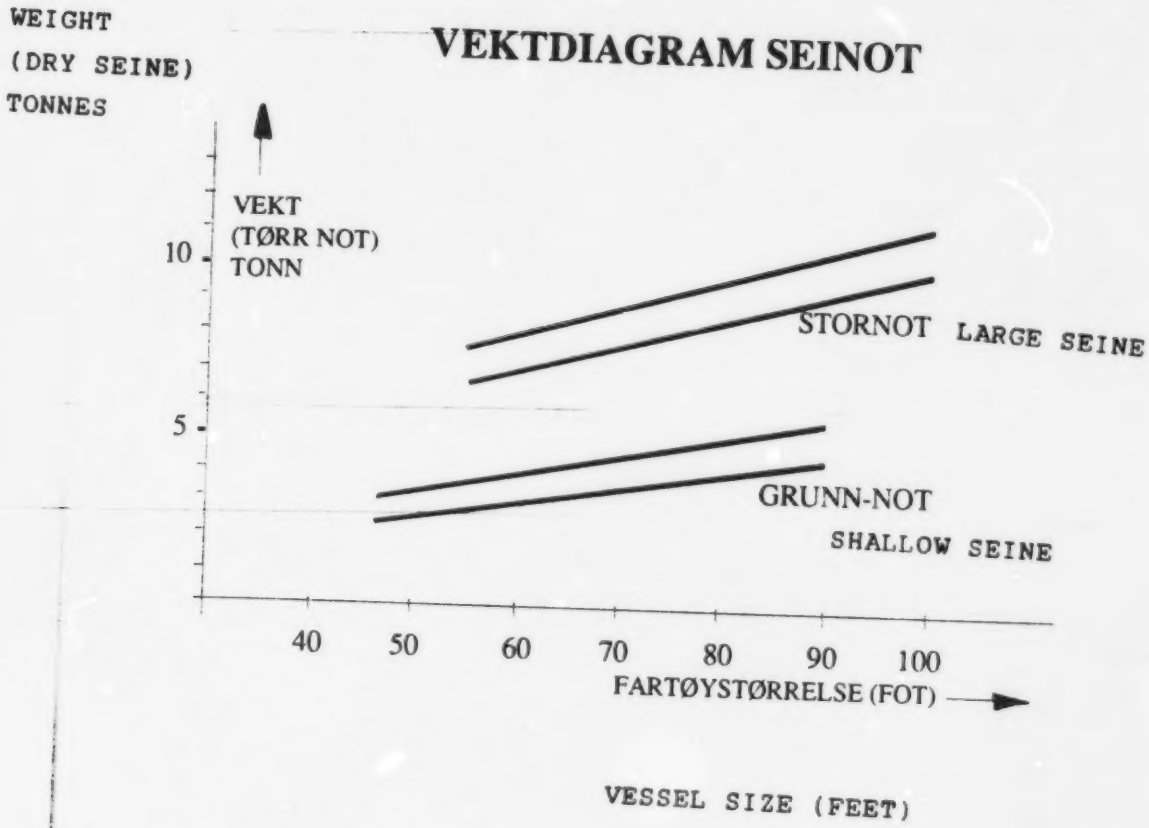
MACKEREL, HERRING AND CAPELIN SEINES



WEIGHT DIAGRAM HERRING SEINE



WEIGHT DIAGRAM POLLOCK SEINE



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8.2 Water uptake of twine

The weights of seines in bins on open decks used in stability calculations are usually dry weight.

To obtain data of water uptake and water content in seines after hauling and weight reduction following draining, the FTFI Fishing Gear and Methods Branch was asked to carry out a series of weight experiments of seine twine.

WEIGHING METHOD

For the weighing experiments a SALTER spring balance model 235 was used with a range of 0 - 150 kg. and 1/2 kg. divisions.

The seine pieces were first weighed dry and then soaked in the sea for 3 - 4 hours at about 2 m. depth.

The first weighing was done immediately after being taken from the sea (within 1 min) and then with increasing time intervals up to 90 minutes. A weighing was also done after 15 hours.

Each individual piece of twine was placed in a net bag of courlene that hung in the balance during the whole drainage period.

The experiments were carried out in February/March 1988 and the air temperature varied between -2 to +7 degrees C.

RESULTS AND COMMENTS

Selection of samples for measuring the water content encompassed both new and used twine of various thread thickness and mesh size, with knots (E/K) and knotless (U/K), see table on next page.

TEST PIECE	SPECIFICATION	DRY WEIGHT(KG)
A	New seine no.6 U/K,30 mm stretched mesh	12.8
B	New seine no.4 E/K, 30 mm stretched mesh	5.4
C	Used seine no.6 E/K, 30 mm stretched mesh	14.8
D	Used seine no.6 E/K, 19.6 mm stretched mesh	11.0
E	Used seine no.16 E/K, 30 mm stretched mesh	8.7

The results of the weighing experiments are shown on Figure 1 where the y-axis expresses the water content in % of dry weight for various types of seine twine (A - E) as a function of the drainage time (x axis).

It can be seen that the water content immediately after being taken up from the sea varies between 66 and 90 %.

The water content, and thereby the weight reduction, happens relatively quickly for the first 10 - 15 minutes. The curve then levels out and there is little difference in the water content from 1 1/2 to 15 hours after being taken up.

There seems to be relatively little difference in water uptake and drainage between twine of different thread thicknesses or between twine with or without knots. There is, however, as expected a higher water uptake in used twine as compared to new. The reason is that newly impregnated twine contains more fat due to the treatment and is therefore more water repellent.

Used twine with 19.6 mm stretched mesh showed a somewhat higher water content than 30 mm stretched mesh. This may sound reasonable, but the magnitude of the difference must be treated with caution because the net piece with the largest mesh size was more used and contained less impregnation. It is therefore reasonable to assume that the variation in water uptake was due mainly to differences in impregnation rather than in mesh sizes. The water uptake of seine twine will therefore increase the longer a seine has been used.

The rate of drainage was approximately the same for all the twines regardless of the original water uptake. This shows that the higher the water uptake the larger the water content of the seine will be over time. It should be made clear that these experiments were made with very small pieces of twine and the samples hung in a netbag with best condition possible for drainage. The test method deviates from actual conditions on vessels where some water will run off when forced through the power block and during transport to the bins.

Considerable quantities of water still follow the seine to the bin where the seine is tightly packed and where drainage can only occur via grate openings in the side of the vessel. It must therefore be assumed that drainage is slower than in these experiments.

Nylon fibre can absorb 10 - 12 % water. When a seine is soaked, water will also adhere to the thread in mesh sides and knots depending on the degree of impregnation. Large amounts of free water will also accumulate between the meshes in the seine. The free water will first drain off, but it will take a long time before the adhered and absorbed water is removed since this will have to be dried out.

CONCLUSION

Based on these small scale experiments, there is reason to assume that the water uptake and thereby the weight increase is not less in practical fishing. The conclusion must therefore be that the water content in the seine twine after a period of 2 hours after hauling comprises an additional weight of at least 30% compared with a dry seine and that the water content is not reduced significantly during storage in the seine bin.

Water uptake and drainage varies insignificantly with thread size and mesh size and between seine with or without knots. There is, however, a large difference in water uptake between new and use seine twine; the water uptake increases with increasing use of the seine.

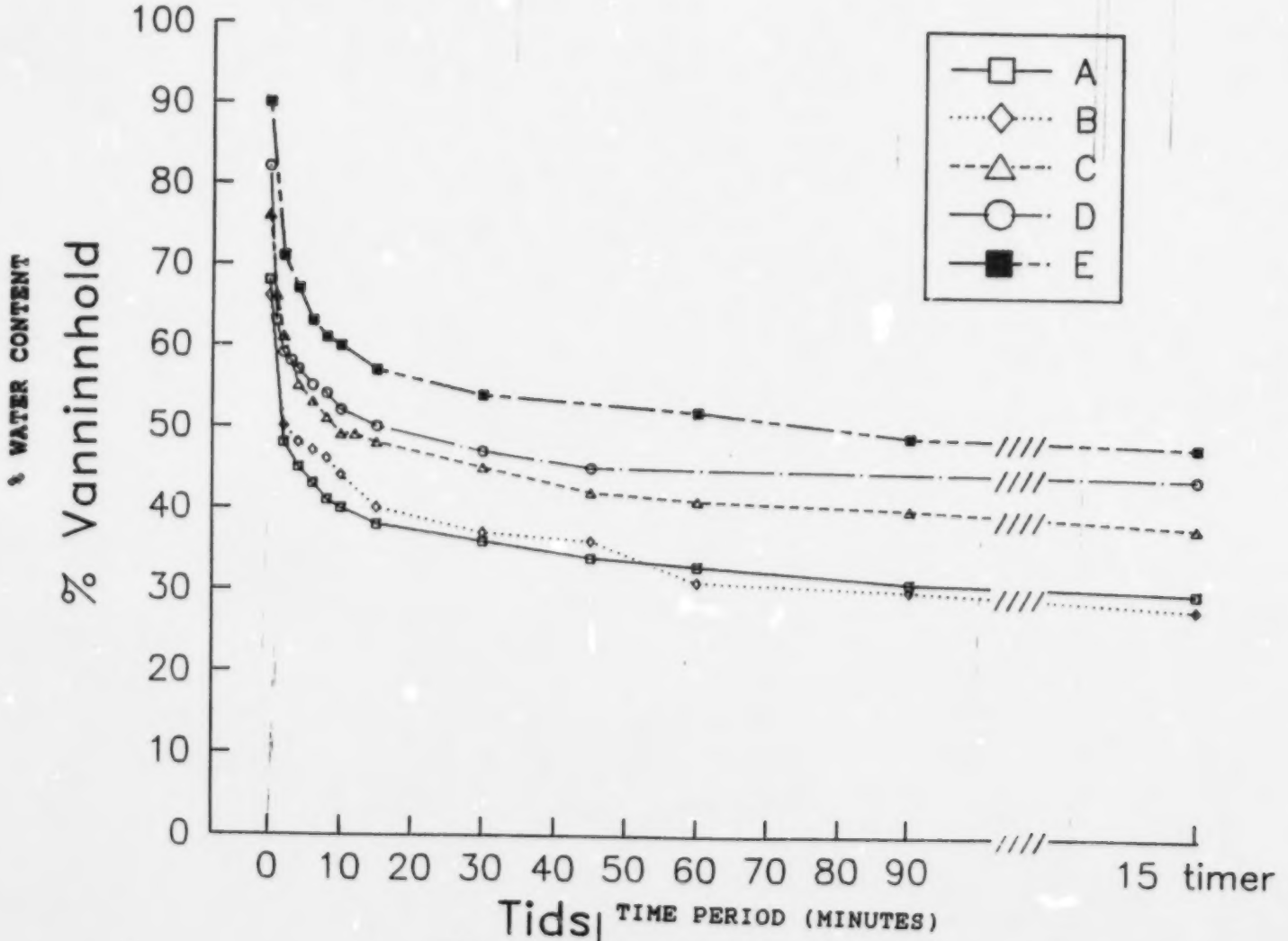

Fig 1. FIGURE 1. WATER CONTENT IN NET

9. CONTROL OF GEAR- AND EQUIPMENT WEIGHTS USED IN STABILITY CALCULATIONS FOR A SELECTION OF VESSELS

For the purpose of comparison and to see if the gear and equipment weights used in stability calculations is close to actual weights, a study of the stability books of 50 fishing vessels were carried out. Most of the vessel that were sent questionnaires were included in this sample.

To be able to carry out the study as rationally as possible, we applied , and were given permission, to access the archives in the Directorate of Shipping where vessel folders containing stability data are found. Our application was approved subject to the data being used and presented without identifying the individual vessels. On the basis of stability calculations and descriptions, the following data were registered and noted for each vessel

- Vessel length in feet
- Fishing methods/combinations
- Year built, number of rebuildings, owners.
- Number of stability calculations carried out and date of the last calculation
- Degree of detail in the description of gear and equipment in the calculations
- Control of, and comments to, the location of the center of gravity used for gear and equipment in the calculations.
- Gear and equipment weights used in the last stability calculation.

9.1. Selection of Vessels

In carrying out spot checks, we did some preliminary studies on the connection between gear weights, vessel sizes and stabilities , and indications are that we should spotlight small and medium size vessels for the following reasons:

-Gear weights have a relatively greater influence on the stability of small rather than on large vessels since the weights comprise a relatively larger part of the displacement.

- For vessels under 110 feet, most of the existing length- and tonnage limitations used are part of regulations.

- There has been a tendency to take in use non-traditional fishing methods on small and medium size vessels. The fishery has taken place so far off shore that a certificate to 200 n. miles has been necessary.

- Space restraints can be the reason for alternative storage of spare gear that deviates from the original which was used in the calculations.

The study included existing vessels chiefly in the size range between 60 and 100 feet where a representative selection of fishing methods is included.

An illustrated list of vessels was used that shows pictures of the vessels and gives name, year built, change of ownership, main dimensions and arrangements , and the following criteria were of importance for the choice of vessels:

-Vessel size- Fishing method- Area fished

- Length- L/B relationship
- Arrangement - Equipment
- Main engine size
- Year built- number of rebuildings and owners
- Estimate of gear and equipment weights according to the weight diagram for the fishing gear in question
- Lightship data and center of gravity for this condition
- Calculation of weight difference in % between used and

estimated weights

A summary of these registrations are given on pages 70 -78. In the same table we have from the weight diagrams for the respective fishing methods estimated and tabled probable gear- and equipment weights, calculated deviation in percent between weights used in the calculations and estimated weights from weight diagram.

The last column in the table gives an estimate of the vertical shift of the overall center of gravity that the corrections given will represent.

CONTROL OF GEAR / EQUIPMENT WEIGHTS AND OVERALL CENTER OF GRAVITY IN STABILITY CALCULATIONS

KONTROLL AV RE ... **SBEREGNING**

VESSEL SIZE (FEET)	FISHING METHOD/ COMB.	YEAR VESSEL BUILT	WHEN LAST STABIL. CALCUL. MADE (YEAR)	DESCRIPT. OF GEAR AND EQUIP	GEAR/EQUIP. WEIGHT USED IN STABILIT CALC. (TONNES)	COMMENTS TO OVERALL CENTER OF GRAVITY	GEAR/EQUIP WEIGHTS ACCORD. TO WEIGHT DIAGRAMS (TONNES)	VEKT-AVVIK WEIGHT DEVIATION IN %	CALCUL. RAISING OF OVERALL CENTER OF GRAVITY (CM)
58	Trål TRAWL Snurrevad SCOTT.SEINE	1984	1984	GEAR ON DECK GEAR IN STORES	2,0	APPEARS SOMEWHAT LOW	4,0	- 100,0	3
SHRIMP 58	Reketrål TRAWL Snurrevad	1984	1986	Trålutstyr GEAR Tråldører DOORS Trålwire	0,80 0,90 1,00	ok	4,0	- 48,1	2
58	Trål Snurrevad	1984	1984	GEAR ON DECK Fisker. på dekk Fisker. i stores	1,5 0,5	Noe lavt SOMEWHAT LOW	4,0	- 100,0	3
58	Reketrål Snurrevad	1984	1986	Trålutstyr Dører Wire	0,80 0,90 1,00	ok	4,50	- 66,0	3
60	Reketrål Garn GILLNET	1985	1985	Trålutstyr Tråldører	0,80 1,40	ok	4,0	- 81,8	5
60	Not PURSE SEINE Snurrevad	1981	1981	Not PURSE Snurpewire Notposer	4,50 0,80	ok	7,5	- 20,9	2
60	Not Snurrevad	1981	1981	NET ~~CAGES~~ Not Wire Notposer	4,5 0,8 0,9	ok	7,5	- 20,9	2

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KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
60	Reketrål Garn	1985	1985	Trålutstyr Tråldører	0,80 1,40	ok	4,0	- 81,8	5
62	Reketrål Line	1961	1983	Vegn Gear	2,70	Noe lavt	4,0	- 48,1	3
62	Reketrål Line/garn	1961	1983	Vegn	2,70	Virker noe lavt	4,0	- 48,1	3
63	Reketrål Line/garn	1974	1982	Trålutstyr	3,50	Virker noe lavt	4,5	- 28,6	3
63	Reketrål Line Garn	1974	1982	Trålutstyr	3,5	ca 20-30 cm for lavt	5,5	- 57,0	4
64	Seinot Reketrål	1981	1981	Pollock seine on stern Seinot på hekk Notbåt på slep Towing skiff	5,00	ok	7,0	- 40,0	4
65	Reketrål Snurrevad	1985	1985 Gear on drum gear on deck	Wire Tråldører Bruk på trommel Bruk på dekk	1,20 1,00 1,00 1,00	ca. 20-30 cm for lavt	6,50	- 54,0	4
65	Trål	1979	1986	Fiskeutstyr på dekk	5,0	ok	6,0	- 20,0	2

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
65	Line Garn	1966	1984	Garnbruk	2,50	ca. 20 cm for lavt	4,50	- 80,0	3
65	Reketrål	1978	1980	Trålbruk Reservebruk	6,0	ok	6,00	---	
65	Trål	1979	1986	Fiskeutstyr på dekk Fishing gear on deck	5,0	ok	6,0	- 20,0	2
65	Reketrål Garn	1955	1987	Tråldører Div. gear Tråler	1,5 0,8 0,9	ok	5,0	- 56,2	4
65	Line Garn	1966	1984	Gillnet gear Garnbruk	2,5	Virker noe lavt	4,5	- 80,0	3
65	Reketrål	1978	1980	Trålbruk Reservebruk	6,0	ok	6,0	0,0	0
65	Reketrål Garn	1955	1987	Tråldører Div.garn Tråler	1,5 0,8 0,9	ok	5,00	- 56,0	4
68	Reketrål Garn	1981	1982	Vegn	2,0	ok	5,5	- 175,0	4

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
68	Reketrål Garn	1981	1982	Vegn	2,0	ok	5,50	- 175,0	4
70	Not Snurrevad	1978	1979	Seinøter Seiposer Arbeidsbåt Div.	5,0 0,8 2,0 0,75	ok	12,0	- 40,4	3
70	Reketrål Torsketrål	1967	1986	Tråldører Trål på trommel Drum	2,20	ok	6,50	-150,0	7
70	Not Snurrevad	1978	1979 Pollock	Seinøter Seiposer Work boat Arbeidsbåt Div	5,0 0,8 2,0 0,75	ok	12,0	- 52,0	3
72	Snurrevad	1982	1982	Fiskeutstyr & Reservebruk	4,21	Virker noe lavt	4,50	- 6,8	0
75	Seinot Snurrevad	1985	1985	Stor not Liten not Lettbåt	6,0 2,0 1,8	ok	14,50	- 48,0	5

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
76	Snurrevad Not Garn	1978	1986	Bruk Lettbåt	2,50 1,65	ok	9,5	- 104,8	4
76	Line Garn	1953	1984	Fiskeutstyr	4,40	Noe lavt	5,4	- 22,0	2
76	Snurrevad Not	1985	1985	Bruk Lettbåt	2,50 1,65	ok	9,50	- 104,8	4
76	Line Garn	1953	1984	Fiskeutstyr	4,40	Virker noe lavt	5,50	- 25,0	2
76	Trål	1969	1983	Wire Trål på trommel Tråldører	3,60 0,50 0,40	Virker noe lavt	7,0	- 55,5	4
76	Not Garn	1974	1978	Notbruk Al.båt	3,0 1,2	ok	9,50	- 126,0	4
76	Reketrål Not	1955	1980	Not på dekk	2,5	ok	7,0	- 180,0	6
76	Not Garn	1974	1978	Notbruk Al.båt	3,0 1,2	ok	9,5	- 126,0	4

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
76	Trål	1969	1983	Wire Trål på trommel Tråldører	3,6 0,5 0,4	Noe lavt	7,0	- 66,0	5
76	Reketrål Not	1955	1980	Not på dekk (siden 1960)	2,5	---	7,0	- 180,0	6
77	Reketrål Garn	1958	1985	Tråldører Trål på tro. Res. trål Nett rull	1,76 0,80 0,40 0,80	ok	7,0	- 59,0	4
77	Reketrål Garn	1958	1985	Tråldører Nettrull Reservetrål	1,76 1,60 0,40	ok	7,0	- 86,0	5
78	Garn Line	1964	1984	Vegn	1,50	ok	5,0	- 233,0	4
78	Garn Line	1964	1984	Vegn	1,50	ok	5,0	- 233,3	4
78	Reketrål Garn	1975	1977	Vegn	2,0	Virker noe lavt	7,0	- 250,0	7

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
78	Reketrål Not	1976	1985	Redskaper	2,0	For lavt	7,0	- 250,0	5
79	Reketrål Garn	1977	1984	Dører Trålwire 2 stk. reketr.	1,50 1,85 0,80	ok	7,0	- 68,7	4
80	Reketrål Garn	1985	1985	Tråldører Tråll m/gear Trålwire, div.	5,30	Virker noe lavt	7,5	- 41,5	3
82	Reketrål Garn	1987	1987	Utrustnings Redskaper	5,86	ok	8,0	-36,5	2
83	Reketrål Garn	1958	1984	Trålwire Dører Trål	2,0 1,6 1,3	ok	7,5	-53,0	3
90	Reketrål	1978	1987	En detaljert og presis beskrivelse	16,0	ok	16,0	---	---
92	Reketrål	1975	1985	Tråltrommel Dører Wire	6,70	ok	15,0	- 123,9	7

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
93	Reketrål Garn	1978	1982	Trålwire Trålutstyr	1,00 2,00	ok	11,00	- 266,6	8
95	Sildetrål Industritrål	1965	1982	Bruk	3,00	ok	6,5	- 117,0	5
97	Torsketrål	1979	1984	Redskaper	10,0	ok	15,0	- 50.0	3
108	Seinot Sildnot	1957	1978	Not	10,5	Noe lavt	17,0	- 61,9	5
110	Industri-trål	1956	1985	Wire Not Dører	2,00 1,35 2,00	Noe lavt	9,0	- 68,2	4
110	Reketrål	1957	1983	Wire Tråldører Trål på tr. Reserve	3,20 2,00 0,75 0,70	ok	18,00	- 170,6	7
110	Reketrål Not	1961	1987	Trålbrett Not på sh.dk. Not i fiskerom	2,2 1,0 2,0	Noe lavt	14,5	- 159,6	5

KONTROLL AV REDSKAPS-/UTSTYRSVEKTER OG FELLESTYNGDEPUNKT I STABILITETSBEREGNING

FARTØY-STØRRELSE (FOT)	DRIFTS-FORM./ KOMB.	FARTØYETS BYGGEÅR (ÅR)	NÅR SISTE STAB. BEREGN. BLE UTFØRT (ÅR)	BE-SKRIVELSE AV REDSKAPER OG UTSTYR	REDSKAPS-/UTSTYRS-VEKT BENYTTET I STAB. BEREGN. (TONN)	KOMMEN-TARER TIL BENYTTET FELLES T.PKT.	REDSKAPS-/ UTSTYRS-VEKT I FØLGE VEKTDIA-GRAMMER (TONN)	VEKT-AVVIK I (%)	BEREGNET HEVING AV FELLES T.PKT. (CM)
125	Reketrål	1968	1987	Fiskeutstyr	4,00	For lavt	16,00	- 300,0	8
125	Makrellnot Sildenot Loddenot	1956	1977	Not i binge	10,0	ok	21,0	- 110,0	5
139	Reketrål	1986	1986	Tråldører Trålgear Trålnot Reserve not, dører, gear	4,1 3,8	ok	20,0	- 153,1	5
154	Reketrål	1986	1986	Redskaper	32,6	ok	26,0	----	----

9.3. Evaluation of results

Even if objections can be raised against both the method of selection and the number of vessels included in the study, the results indicate that the assumptions and basic information that parts of the stabilization calculations are based on can often be faulty.

It should be made clear that for many of these vessels the correction of gear weights indicated will not result in corrections large enough to place approved stability states in danger, but with few exemptions , the results indicate that vessel stabilities are poorer than those given in the stability papers. The state of each vessel and the magnitude of the deviation will be decisive; vessels with small margins to certain stability criteria can have problems and would need to take corrective measures. It should be made clear that the reference- and comparative weights given must only be considered to be a guide and are not final. It is the actual weight onboard the individual vessels that is to be used for calculations, and it could be possible that there are gear that deviate considerably from the average values read off from the attached weight diagrams.Regardless of consequences or not, the study has exposed a somewhat variable, but still extensive underestimation of gear weights. The reason for this sad state can be many, and the following questions are obvious:

- Is there a conscious manipulation of data or is it an expression of lack of competence in this area by authorities or companies?

- The defamatory statement above can be justified in the cases where the stability is in a borderline area, but there is no reasonable explanation for deviations where the margins are wide enough that no adverse consequences would result in using the correct values.

-There is much prestige involved for the naval architects or consultants, the shipyard and the owners to be able to complete a

job successfully. A possible explanation can in many cases be that the gear weights are used as a "balancing entry'?

- Could it be that the loading of gear usually occurs at another place after the vessel has left the yard and that what happens after the responsibility has been transferred to the owners does not concern the yard?

- Do shipyards and consultants still use the most convenient solution by asking the owner or skipper about gear weights in a hectic final phase and using these data where certainly much has been left out in the final calculations?

- A vague definition of the state "lightship" can be the reason for varying routines and practices; equipment that belongs under gear could be camouflaged and be included in the "lightship state".

The moral of a sad story like this is that it leads to doubts about the purpose of paying large sums of money for socalled "expert advice" when spot tests show that many shipyards and ships consultants seem to lack the ability to evaluate the whole in these cases. An example is that scrap and rubbish onboard is being counted when unloaded and deducted from lightship data. Corrections for free liquid surfaces in tanks are being performed, while serious underestimations of gear weights that have a greater influence on the results are not priorized to the same degree.

Some of the explanation must be found within these statements, but to find "scapegoats" should not be a priority, rather to present suggestions for correcting the problem.

A lack of reaction after serious accidents in the fishing fleet is often the beginning of reactions from relatives and colleagues on what has to be done before the authorities react.

Accidents or events ashore that would have been likely to result in serious accidents or injuries can have repercussions and the police can be asked to ascertain if any of the parties have been irresponsible. In some cases the event can lead to litigation in civil courts.

9.4. Suggestions for measures.

1. Requirements for better and more detailed specifications of gear and spare equipment in the calculations. The calculations given in this report can be a guide.

2. To develop a comprehensive selection of diagrams of gear and equipment weights related to vessel sizes and fishing methods. There is no doubt a need for improving the examples in this report.

3. There is an obvious need for improving and raising the level of competence in this field within the authorities, companies and control bodies that with governmental approval are carrying out these functions.

4. In my opinion there is a requirement for a more precise definition of the lightship state for fishing vessels where the most unfavorable condition is included; gear weights will here form a considerable contribution for some fishing methods. The actual opportunities that the individual vessel have for use of water ballast or fuel oil to improve stability must be evaluated in this connection.